Canadian Government Surveys.

Continued from page 19.

II.

BY D. L. S.

Written for ENGINEERING NEWS.

After a period of suspense and doubt lasting, we will say from March till May, one day in May comes a letter signed by the Crown Lands Commissioner, telling the lucky surveyor that in a few days he will receive particular instructions to survey a certain township, and that in the meantime he is to fill up the enclosed bond for (say) $1,000. And, sure enough, in a few days the instructions come, —written sheets which vary according to the location of the township, and to the system by which it is to be laid out, and a printed sheet of general instructions. The substance of the general instructions is as follows:

Bearings of lines must be got by astronomical observations, an account of which must be kept in the field-book.

Lines must be well cut out, and trees adjacent to line blazed on three sides. Surveying instruments must be kept in adjustment. Posts must be made of durable wood, squared from top 2 feet down, and marked with lot and concession numbers. They must be 6 inches square, planted firmly in the ground, and their position noted by taking courses and distance from them to nearest tree, which trees are to be blazed on the side next posts and each marked B. T.

Any boundary lines of adjacent townships already run must be taken as correct and used as boundary lines for your own township. Lakes and large rivers must be traversed, and the traverse lines must be connected with concession or side lines.

All lines must be run by contracting surveyor in person, or under his supervision by some P. L. S. authorized by Department.

Note must be taken of extent, value, and position of squatters improvements if any are found.

After completing field-work a plan of township must be made on a scale of 40 chains to 1 inch, showing length and bearing of all lines run, and area of each lot in the township. Also exact cutting on each line run, of hills, swamps, marshes, meadows, lakes, streams, clearances, etc., sketching in approximately the intermediate portion of these features. A timber map must also be furnished to the Department, showing the position and quantity of different kinds of timber.

A field-book must be kept showing one side of a block (80 or 100 chains) on each page.

In this must be sketched everything that appears on the plan, and the distances must be written down in the column left for that purpose. It must also show the kind and quality of soil and timber, the general character of the country; a description of all waters met with; the triangulations, offsets, etc., necessary to cover these waters; the kind of wood in all posts, their dimensions and the marks on them, with courses and distances from posts to bearing trees; the details of astronomical calculations, and connected diagrams of traverse of lakes and rivers.

A report on the survey must be furnished to the Department, and an account for the total number of acres in the township at the rate of seven cents per acre, which is to cover all expenses.

Field notes and accounts are to be attested on oath.

The surveyor is also instructed to take notes of the geology of the country where the survey lies, and to transmit small specimens to the Department.

The account will not be closed till the Department has satisfied itself through its inspector, that the survey has been made in accordance with instructions and bonds.

There are two methods of laying out townships now in use in Ontario, one of which prevails in the northern part of Nipissing District

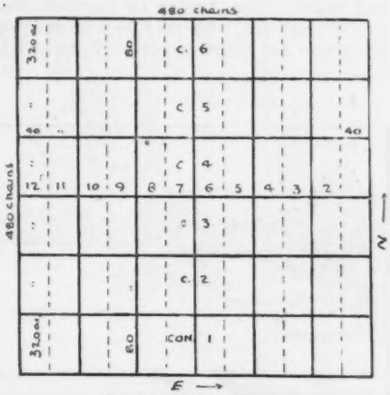


FIG. 1. TOWNSHIP SURVEY.

and in Algoma, and the other in Muskoka and the newly opened country south of lake Nipissing.

The extracts that follow are taken from particular instructions to a P. L. S. to survey a township north of lake Nipissing:

TORONTO, May 18—

Instructions to P. L. S.,— to survey the township of K. in the District of Nipissing, into lots of 320 acres each:

SIR: I have to instruct you to proceed to the Township of K. and to survey the same into lots of 320 acres each

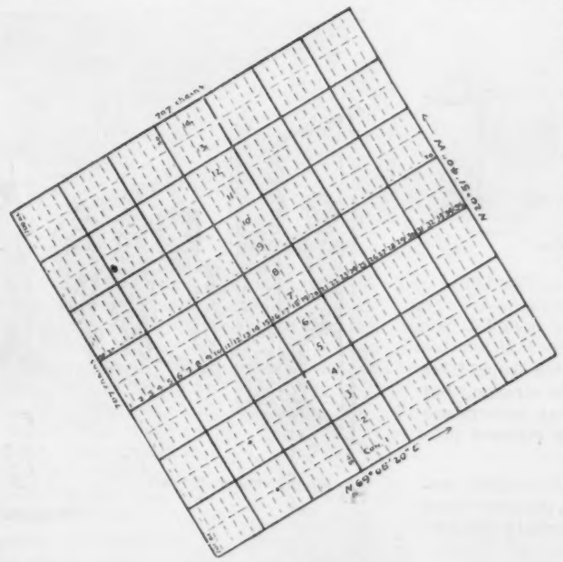


FIG. 2. TOWNSHIP SURVEY.

in accordance with the projected plan herewith transmitted for your guidance, the lines to run being shown thereon.

The township is bounded as follows—on South by Township of L. surveyed last year by P. L. S.— On the West by Township of M., surveyed by P. L. S.— and on the north and east by the unsurveyed lands of the Crown.

The regular lots are to have a depth of eighty chains, and a width of forty chains. The lots are to number 1 to 12 inclusive and the concession from south to north from number 1 to 6 inclusive.

The concession lines are to be run due east and west astronomically, and the side line at right angles thereto or due north and south astronomically.

You will commence your survey at the south-east angle of the Township by retracing westerly the north boundary of L. as the front of your first concession planting your posts at regular intervals thereon. Your west boundary has already been run *. This you will retrace. You will find the sixth concession about 11¾ chains longer than a mile on your west boundary to a spruce post set by P. L. S.— on a base line. From this post you will run east as your north boundary. * * * You will plant * * * at the front angles of the lots * * * posts marked with a proper marking tool or scribe, the numbers on the lots on the east and west sides thereof and the number of concessions on north side.

The concession being single-posted you will not mark on the south side the posts between lots 1 and 2, 3 and 4, 5 and 6, etc., in any of the concessions as these posts have no reference to the lots south of them, but form the starting points for their respective side lines, which will be drawn parallel to their respective governing line.

You will not lay out any concession or side road allowance * * * * You will obtain by calculations or offsets in the field all widths of lakes, rivers, etc., cut by your lines * * * * In the copy of field notes which you will send to this Department, you will etch in with ink your hills, swamps, lakes, rivers, etc., as it has been found by experience that those done in colors are liable to fade.

You will show on your plan and field notes the intersection of the concession and side lines of adjoining townships with the outlines of your township * * *

You will read over your instructions, written and printed, carefully, and if you are in doubt about anything will apply to the Department for information.

You will be allowed at the rate of seven cents per acre on the total area of the township, to cover all expenses connected therewith including returns, provided that after an examination on the ground, your survey be found satisfactory and that your returns are correct. An advance of $400 will be allowed on account of this survey or your furnishing approved security * * * I have the honor to be Sir

Your obedient servant.

(Signed) T B. PARDEE,
Commissioner of Crown Lands.

If the survey is to be made by the older system that prevails south of Lake Nipissing, the instructions will be different in so far as they refer to the size of the township and the lots, bearing of lines, and planting of posts, since by this system townships are laid out 707 chains square, divided into blocks 100 chains square. (Fig. 2.)

The concessions are double-fronted, and the lines are run in the center of the road allowances—the side lines running N. 20.° 51′ 40″W., and the concession line N. 69° 08′ 20″ E. astronomically. The township is divided into fourteen concessions, each 50 chains deep, numbered from south to north: and each concession into thirty five lots, each 20 chains wide, numbered from east to west, or from west to east.

A road allowance 1 chain wide is left between concessions 2 and 3, 4 and 5, 6 and 7, etc., and between lots 5 and 6, 10 and 11, 15 and 16, etc., in every concession. A road allowance of 1 chain also separates each township from the adjacent ones.

Posts are planted in the center and at each side of the road allowances, thus necessitating three posts at every lot intersection, and five posts whenever the road allowances meet. This profusion of posts is a cause of delay, or more frequently of careless work, for it is exceedingly hard to find chainmen honest enough to hew out good posts and to plant them carefully, when in following the instrument on concession lines, they have to make and plant eighteen posts every 100 chains.

There are other clauses in the instructions which it is sometimes unadvisible, sometimes, impossible to follow; for instance, the one in the particular instruction which orders the

*The Provincial Government occasionally sends out picked men to run a base line, from which new Townships are laid out.

survey to be commenced at a certain corner, etc.

Also the clause which says that concession lines are to be run due east and west, and side lines at right angles thereto, and due north and south astronomically—which every surveyor knows to be utterly impracticable.

Another often disregarded clause is the one which insists on the surveyor running the lines in person. It is well known by the Department that most of the lines in a bush township are run with a compass. To be a compass-man it is not absolutely necessary to be a surveyor. A good compassman must be a sharp, active fellow, and need not be very well educated, and may know no more of stars and triangles than do the birds he scares in the bushes, provided the line has no obstacles to chain measurement.

Taking all things into consideration, however, the instructions are as a rule pretty closely adhered to. The surveyor may fail in some of the points just mentioned; or perhaps the posts do not all come up to the required standard: some of the bearing trees may not be very carefully taken—or may be omitted; the lines may be bent a little too much near the corner posts; the lakes and rivers may not be very accurately traversed (which, consider-

THE COOK.

ing the fact that nothing extra is paid for traverse, can hardly be thought strange,) but on the whole, modern provincial surveys are reliable, the system of survey pursued preventing many gross errors.

The instructions received, the security procured, and the contract signed, the next thing the surveyor has to do is to get ready his outfit and supplies.

In the way of surveying instruments, suppose he is going to run two gangs, he will take a transit or theodolite, 2 compasses, 2 or 3 chains and sets of pins, a micrometer perhaps for scaling lakes and ponds, adjusting instruments, extra compass glasses, timber-scribes, etc.

He will need tents, blankets, cooking-utensils, knives and forks, tin plates and cups-bags, and thump-lines for packing.

His provision list will comprise flour, pork, beans, sugar, dried apples, tea, coffee, rice, biscuit, baking-powder, yeast, condiments, and raisins or currants for occasional puddings.

He will also most likely provide a medicine chest with linen, salve, pain-killer and physic, vegetable tar and oil, or something of the kind, to keep off mosquitoes, and soap for those who indulge in the luxury of washing.

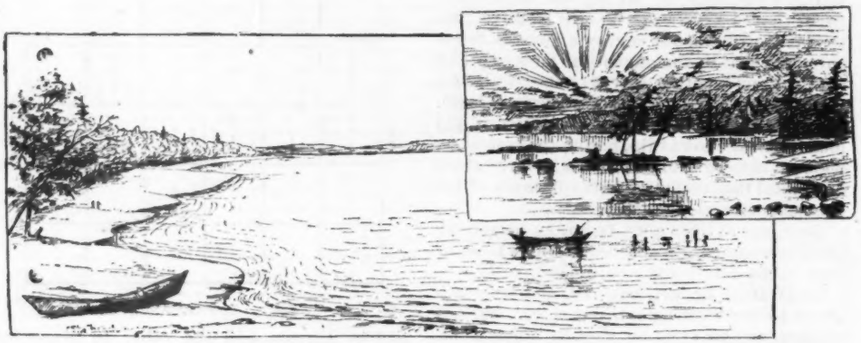
Instructions, field-books, maps, almanac and mathematical tables, will form the principal part of his literature, for the great object in bush surveys is to carry only what cannot be done without.

To run two gangs in the bush the surveyor will require from twelve to fourteen men; a chief assistant, who may be a brother surveyor who has failed to get work, an articled pupil, or perhaps a mere compass-man, such as described above; two head chainman, who must know enough to keep correct and legible notes of the distances measured and of the posts and bearing trees; two assistant chainmen who must be capable of hauling a chain through brush and over logs all day, and must be handy with the axe so as to hew out posts neatly and quickly; a cook, on whose capabilities will depend a great deal the financial success of the contract—for nothing is more apt to cause dissatisfaction among the men or even make them leave the work than bad cooking and scanty meals. But let the cook, like a good housewife, provide good food and regular meals, and the rest of the gang, like an average husband will be kept in good humor.

The rest of the party will be composed of six or eight axemen and packmen. It is advisable, however, in fact almost necessary that every man hired shall be able to carry a good pack and to swing an axe.

Young men being less apt to spare themselves are generally preferable to older ones. A class particularly to be avoided is composed of those who go out to enjoy themselves under the impression that a survey is a sort of long pic-nic. We have never seen one of this class turn out satisfactory.

The assistant and perhaps a few others will very likely be taken by the surveyor from home, but the majority will be picked up at places as near as possible to the township to be surveyed. At such places there is always a floating population of shanty-men and river-drivers (of timber) who, about the time when surveys are begun, can be found, more or less sober, about the hotels and drinking dens that often form the major part of the houses. Most of these men are French-Canadians, who, as a rule, are not a success on a survey—but among them will be found settlers, squatters and farmers' sons, of British descent, good axemen and hard-working men, who make the very best material for a survey party.



THE BEACH AT NORTH BAY

THE PLACE TO LOOK FOR MEN.

It is not always an easy matter to make up such a party. Some years ago we had occasion to get one together for the survey of a six mile township in Nipissing district. Travelling by the C. P. Railway we stopped at Mattawa, a picturesquely situated village at the junction of the Ottawa and Mattawa river. Here we bought most of our supplies and hired three French Canadians. Then we went on to North Bay which was the point from which we intended to start for the woods. North Bay is built on a sandy flat at the north-east part of Lake Nipissing. For over a mile along the water in front of the village stretches a beautiful sand beach one hundred feet or more wide, and the water out from it is so shallow that the C. P. R. Co. has been obliged to build a pier to a distance of

15,000 feet or so from the shore in order to get 6 feet of water for the landing of boats. The trees that edge the beach are chiefly poplar and white birch, with a sprinkling of pine and spruce. Half a mile or so back from the lake the ground rises into hills. The village at that time comprised a couple of dozen board and log houses, (the best of them the property of the C. P. R.). Nearly all of these except those belonging to the railway company had little private bars where beer, gin and whiskey, or what passed for such, could be had at almost any time. The proprietors paid for their licenses by being raided periodically by the Government officials and fined, after which they immediately resumed business.

TOO YOUNG.

TOO OLD.

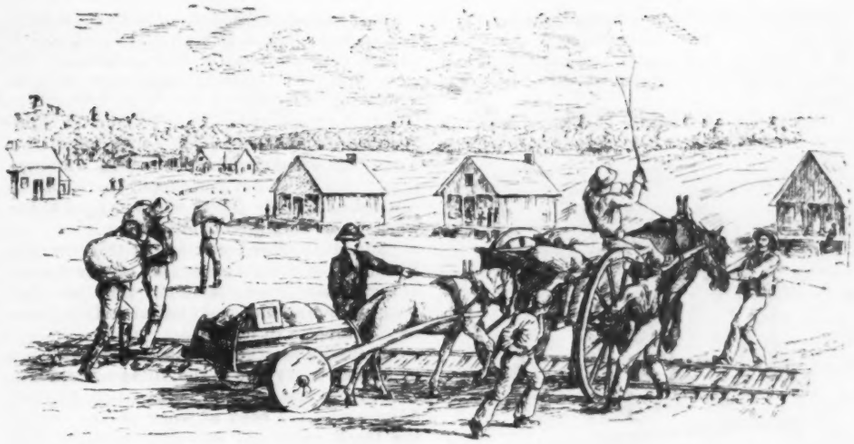
TOO DRUNK.

Here after some difficulty, we made up our party, getting a cook and some axemen from Muskoka district and four men from North Bay, which four came, as honestly avowed, to get away from "the damn liquor," and judging from their state at the time they were hired, it was high time for them to do so.

With this not very promising gang we moved our supplies in carts, along the new government road and by a jumper path, (part of the old Indian portage from the headwaters of the Mattawa to Lake Nipissing) to Trout Lake. Here we procured canoes and ferried everything across the lake to a trail by which we intended reaching our work. At this point the goods, etc., were made into packs of 75 to 100 pounds each, and transported on the mens backs to a lake, some four or five miles away, where we camped.

The next morning a raft was made of cedar logs withed together. To propel it, oars were made from split balsam trees, and on this primitive craft we crossed the lake. Then, shouldering the packs again, we trudged on towards the township.

The trail was very rough—over fallen timber and up precipitous hills and through swampy places over-grown with alders. The work told terribly on the men, especially on those who had scarcely got over their North Bay spree. Before we had gone far four of them were out of sight and hearing, and three of the four lay out all night at the foot of a hill which they could not climb with their packs.



LEAVING NORTH BAY.

At last, after considerable hard work, we reached the township and began work by taking the necessary observations for meridian and for magnetic variation, and then, putting one gang on a transit line, run northerly from the south boundary between lots 8 and 9, while the other gang filled in the adjoining lines with a compass.

CROSSING TROUT LAKE.

This method of surveying, properly carried out, is as accurate as can be desired in bush surveys. The transit line being run carefully, both as to chainage and bearing, makes a sure check on the less reliable compass lines.

Suppose a transit line to be run and the posts at intersection of lots 8 and 9 with concession 2 and 3 to be planted on this line. A compass line is then run northerly from the south boundary between lots 10 and 11 to concession 2 and 3. Here a temporary post is planted, and from this post a line is run easterly along the concession 2 and 3 to the post planted on the transit line. If the compass line comes out 20 links short of this post and 15 links north from it, the conclusion come to is that the chainage is correct, but the bearing of the compass line is wrong. The temporary posts will then be planted on the true line and the line already cut will be bent to pass through the posts.

A couple of days after beginning work one of the Frenchmen from Mattawa fell sick. The other two of course thought it necessary to leave with him, so one gang was demoralized at the very outset. The only thing to do was to get more men, so while one gang continued the work we went out along the trail just travelled over to find them. What trouble we had in getting them will be best told in the following extracts from a diary kept at the time.

THE RAFT.

"North Bay, Friday, August.—Ever since I

came here I have been hunting unsuccessfully for men. * * * The old landlord at the C. P. R. Hotel, has just shown me my bedroom which contains twenty beds all of them occupied.

"Saturday.—Last night in spite of the noise

A BAD DAY AND A ROUGH TRAIL.

wafted on the somewhat foul air from at least fifteen out of thirty melodious noses, and notwithstanding a dread (which was not without a cause) of "creeping things innumerable," I managed to get a little sleep

"This morning there were still no men to be found at North Bay, so I went to Du Chesnay creek to see what I could pick up

THE BED ROOM AT NORTH BAY.

there. At the creek I heard that the men working at the C. P. R. gravel-pit will probably be discharged to-day, so I may be able to get some of them.

"From the creek I went to the Indian Reserve where I found no one but a half-breed chief who could not speak English. My own stock of French being exceedingly limited we had some difficulty in understanding each other, but after saying to him, "Donnez-moi des hommes," a few times, he seemed to grasp the idea, and soon made me acquainted with the fact that the only men on the reserve who could go on a survey were hired yesterday by some other surveyor—confound him!

"Going back to the Bay again I found a group of eight Italians near the lake shore.

"I tried to hire a couple of them to go with me, but could get nothing more satisfactory from the interpreter than— 'You vant a yee't-a-man,ot-a ryeet'-a. Doo no go,' which speech is very characteristic of that picturesque but dirty race, for it is almost impossible to split up a gang of them.

"At the hotel at tea-time I found an Englishman looking for a job, and I hired him. Late this evening a man came in who was sent to me by one of the shopkeepers, and as he seemed a hardy fellow who was used to the bush, I was delighted to get him.

"Sunday. After breakfasting this morning I went out man-hunting again. At the station I heard that the gravel-pit men are discharged, but as they wont be paid off till Tuesday I cannot wait for them.

"Late this afternoon, when, after inquiring of almost every one in the village, I was unable to find one suitable person, two English fellows who had been at work at the end of the track, came and offered themselves, so I took them.

"And now I shall go and try to get a good night's rest ready for to-morrow's work. This, by the by, is now not quite a hopeless task, for since my first night here I have been honored with a room where I am comparatively alone —that is there are only six occupants (human) besides myself."

The next morning with this hopeful gang, three of whom were green Englishmen, we started for the townships once more. On the way we discovered that two of the Englishmen were almost useless in the woods losing themselves whenever out of sight, and in fact showing that the only safe job for them would be chaining so that the other chainmen could keep them in hand and prevent them straying off line.

Once more in the township the work went on uninterruptedly for some days, when two of the men who had formed part of the original party, becoming dissatisfied with the hard work, announced their intention of leaving.

One of the Englishmen having shown himself to be possessed of no faculty in particular but that of utter helplessness, and two of the North Bay men showing talents of a similar kind combined with laziness, it was decided to discharge them, and an assistant was sent out for new men. He was lucky enough to meet with some young settlers who were looking for a job, so work was soon re-commenced to go on without further delay from the same cause until its completion. It was thus nearly two weeks after first reaching the township before work was systematically carried on. This was of course an exceptionally bad case, by far the worst we ever experienced, but it very seldom happens that a surveyor can lay out a township without having to undergo something of the kind.

ITALIANS AT NORTH BAY.

Stand Pipes.

BY JOHN F. WARD, 18 BROADWAY, N. Y.

Written for ENGINEERING NEWS.

Stand-pipes for water-works, made of wrought-iron or steel are so generally used especially in the level western States of this country that no discussion is here required of their usefulness or merits, and as to their history it would hardly pay for the telling.

A summary of working specifications will perhaps serve to assist some of those who get bewildered at finding that the calculations of different builders and engineers vary so widely as to how the job in hand should be done.

The choice between a reservoir, a tank, and a stand-pipe, is often one requiring calculation, judgment and experience. If an earthen reservoir is a possibility, both engineers and capitalists are by this time so far educated as to adopt it at any reasonable cost. Where the site is not quite high enough for a reservoir to be built of earth, an artificial mound of earth is sometimes raised as a support for an iron tank, but in many cases we have to work from a level too low to reach our intended elevation by any such hill as this, and must get our heads of water by other contrivances.

To illustrate the matter I will describe a situation which recently came up in actual practice. A system of water works was to be built under a contract with a town by which 2,000,000 gallons of water in twenty-four hours was to be raised to a height of 200 feet above datum line, in a stand pipe 15 feet in diameter and the level never to fall below the required maximum height by more than 50 feet. The highest available ground elevation was 25 feet, so the requirement was plainly a 170 feet stand-pipe.

A tank was recommended 25 feet in diameter and 25 feet deep, set on a well braced frame work of iron 150 feet high. This would hold nearly 40 per cent. more than the quantity in the 15 feet pipe above the 150 feet minimum limit, and at an average height 12½ feet greater.

The water in this tank it was shown would be always available for fire purposes without the delay in pumping up to the necessary head as required in a plain pipe, and the tank full would equal in capacity 69½ feet of the 15 feet pipe. This delay in pumping up in case of a fire alarm, when the water level has been permitted to fall considerably, is one of the strong arguments often urged against any use of stand-pipes, and has given birth to a number of ingenious devices for disconnecting the stand-pipe from the distributing pipes automatically in emergencies.

Another recommendation to the elevated tank plan in this case—one which frequently excites the most reverential attention—was that it would cost less money; but the contract could not be altered and the big pipe will be erected in its simplicity.

The main plan and dimensions of the tank or pipe having been decided upon, the next important inquiry is, as to how thick should the plates be in the shells. There is no trouble in finding a rule something like this—Multiply the diameter in feet by the pressure in pounds, divide the product by 1,000 and the quotient will be the thickness in decimals of an inch.

This is a common rule for steam boilers, and allows for riveted joints and assumes a net strength of iron of 6,000 pounds per square

inch, or twice the margin of safety often used in bridge work.

Now the largest stand-pipe we have record of, is the one built by Mr. J. D. Cook at Sandusky, O., being 25 feet diameter by 208 feet high, in which case this rule would make the lower sheet 2½ inches thick, whereas it has stood for years with a thickness of only five-eighths of an inch.

Again, if we try this rule on the upper part of a 5 feet stand-pipe where the pressure is only one pound, we find as a result five thousandths of an inch—thinner than the thinnest tin plate in the market. This rule is quite reliable for steam boilers where the pressure varies only say from 30 to 150 pounds, and the diameters from 2 to 10 feet, but does not work on stand-pipes and tanks, with their extreme range of pressures and proportions.

To provide for all cases a constant must be introduced, as in this formula which I have used in a large number of calculations, and can recommend as both reliable and simple:

$$\frac{h \times d}{10\,000} + .2 = t$$

in which h = pressure of water in feet, d = diameter of pipe in feet, and t = the thickness of iron in decimals of an inch.

In case steel, or iron of extra strength and quality is used, the constant .2 can be reduced to .15. This rule would give the thickness of steel in the Sandusky pipe

$$\frac{208 \times 25}{10{,}000} + .15 = .67 \text{ in.}$$

and the 5 foot iron pipe at 4 feet from the top

$$\frac{5 \times 4}{10{,}000} + .2 = .202 \text{ in.}$$

or No. 6 Birmingham gauge.

A steel tank 100 feet diameter, and 50 feet deep by this formula should be .65 inches thick next the bottom, and the upper course 19 inches thick. These examples serve to show the reliability of the rule at all extremes.

The thickness should decrease in about six changes until the top is reached, and each change can be calculated by the same formula, using the distance of the lowest part from the top of the pipe.

The thickness of the bottom can be made the same as the sides of the pipe at half height, unless the stand-pipe or tank is to be put on some foundation calling for an extra strong bottom, as for instance it is to rest on iron beams direct.

To attain economy in price it is better to allow a considerable choice as to the size of the sheets of which your stand-pipe is to be constructed, as the mills from which it is to be gotten differ as to their capacity for rolling certain sizes, and if you insist on arbitrary dimensions, the iron may have to be brought from a great distance, and cost quite a large sum in excess of what you could do if a little reasonable in the matter.

From 4 to 5 feet wide, and 12 feet long is about a fair size of sheet in most parts of this country.

The vertical joints should be double-riveted for at least two-thirds of the height. It is a simple waste of material and labor to double-rivet the horizontal seams as they have so little work to do—the strain under any circumstances being far less than on the lower vertical joints.

The calking can be done inside or out, as circumstances or convenience may dictate.

The bottom should be connected to the shell by an angle iron riveted to each, the legs of which will measure about ten times the gauge of the heaviest sheet to be connected.

The top of the pipe should be trimmed on the outside with a flat iron band or hoop of a width equal to fifteen thicknesses of the top sheet and the thickness one sixth of the width.

Trimming the top, inside, is apt to produce trouble with the floating mass of heavy ice which always forms in a severe winter and frequently shows above the top of the pipe.

The foundation and holding down bolts should be proportioned to the assumed wind pressure, and to each other. Use one 1¼ inch bolt for each 16 feet of height of the stand-pipe, with masonry foundation 8 feet deep and 3½ feet larger than the stand-pipe on each side. For example, if the pipe is 160 feet high by 10 feet in diameter, to use ten bolts, going through a foundation 17 feet in diameter, is a good approximation. Each bolt should pass through a strap lug attached to the lower part of the pipe by six or eight rivets.

This arrangement of base will give considerably more stability to resist wind pressure than the great sheet iron chimney 279 feet high at Creusot, in France, possesses, which structure shows conclusively from its size and stability, so far as heard from, that its proportions are suitable for daily use in this kind of work, especially as the normal condition of a stand-pipe is to be ballasted with water beyond all risk of overthrow.

The connecting pipe from the main to the stand-pipe need not be more than half the diameter of the main, if it is a short one. The loss of at most 3 or 4 feet of head out of the stand-pipe by the extra friction when the water has been allowed to run down, and the same amount added to the pressure in the main when pumping up in an emergency, are both gains, and the liability of accident to this connection is less the smaller it is made, and wrought-iron had better be used in its construction.

I do not put a manhole in the side, as the usefulness of it is not so manifest as the weakness produced by it, and the trouble of one leak there, will counterbalance years of supposed convenience.

A handy ladder can be made with sides of iron 1½ inches × ½ inch and rungs of ½-inch gas pipe bolted through and placed four inches from the outside and fastened to every second sheet. This had better not come down to within ten feet of the ground or it may be the death of some ambitious youth.

Never make a tapering stand-pipe. It costs more for the same cubic capacity than a cylindrical one, it has less storage capacity at the top where capacity is of some use, it weighs more for equal strength, and its shape prevents the ice in cold weather from moving up and down with the variations in height of the water column, which produces very serious trouble, as I have learned by experience.

It will be found by the student in these matters that the proportions of the lightest tank to hold a certain amount of water, are two of diameter to one of depth, and if he will read the description of M. Intze's tanks in *Le Génie Civil* of June 12th, 1886, he will get some very interesting information in regard to domed and conical bottoms arranged in divers ways.

In calculating U. S. gallons, the following rules will be found very convenient and can hardly be classed as "approximations" for if the quantity measured in this way is assumed to be heated or cooled 10 degrees, it will cover all discrepancy in volume, from the results of the most elaborate calculation. Let

h = height of tank in feet, d = diameter in feet, g = capacity in gallons; then

$$\frac{.17g}{d^2} = h \qquad \frac{.17g}{h} = d^2 \qquad \frac{h \times d^2}{.17} = g$$

Municipal Engineering; Paper No. 2.*

PROVIDENCE, RHODE ISLAND.

(*Continued from Page* 7, Vol XVI).

Telegraph Poles and Wires.

The following ordinances are of recent adoption and regulate the erection and use of wires for conducting electricity for telegraph or telephonic purposes and also for heat, light and motive power. As this question is one of growing interest the ordinances are inserted in full:—

No. 177. An Ordinance Regulating the Erection and Use of Wires for Conducting Electricity for Telegraphic and Telephonic Purposes.

[Approved April 24, 1884.]

It is ordained by the City Council of the City of Providence as follows:

The following regulations are hereby established for the running of wires in the City of Providence, to be used for the purpose of conducting currents of electricity for telegraphic and telephonic uses.

I. No such wires shall be placed or maintained in, over or under any street, square, lane, or alley in the City of Providence, without the permission of the city council, nor till the person or corporation placing or maintaining the same shall have filed with the city clerk a written agreement accepting and promising to abide by and perform all the conditions and provisions of this ordinance and all ordinances and orders in amendment of or in addition hereto that may be hereafter enacted.

II. All such wires when placed above the surface of the ground, shall be suspended from such supports and attachments as may be approved by the city engineer, and such supports and attachments shall at all times be provided and maintained at the cost of the person or corporation using such wires.

III. All such wires when placed below the surface of the ground, shall be laid and maintained in such a manner and place as the city engineer may approve, at the cost of the person or corporation using such wires.

IV. Any person or corporation erecting any poles to support such wires, shall permit such poles to be used for other wires and attachments thereof, than his or its own, whenever the city council shall so direct, and upon such terms as the city council may impose.

V. Poles shall be erected at such points as the city engineer may indicate and not elsewhere. The location of any and all of the poles shall be changed at the expense of the person or corporation using thereon, and by such person or corporation whenever and as the city engineer may direct. And any and all poles may in case of the public necessity be removed at any time without notice, by the City of Providence or its officers, agents or servants acting in the performance of their duty, without any claim for damage therefor, on the part of any person or corporation owning or using such poles.

VI. Said poles shall not be used for the support of, nor shall said wires be placed in contact with, any wires used to conduct currents of electricity for the transmission or production of light, heat or motive power.

VII. No telegraphic nor telephonic wire shall be stretched diagonally across any street, square or alley within the first building district below the tops of the buildings therein.

VIII. Permission given by the city council to erect or maintain such poles and wires may be revoked in whole or in part, at any time, and any of such wires may be cut and removed at any time, without notice, by the City of Providence or its officers, agents or servants, acting in the performance of their duty, without any claim for damages thereof or on the part of any person or corporation owning or using such wires.

IX. Every person or corporation erecting, maintaining or using such poles or wires shall indemnify, and save harmless, the City of Providence, its officers, agents, and servants, from and against all lawful claims and demands for injuries to persons or property occasioned by the existence of such poles or wires, or the transmission of electric currents by means thereof, and the said city, city council, or city engineer, or the agents, or servants of said city, exercising the rights, powers, and permission, and subject to the restrictions respectively given and reserved herein, shall not be held liable by such person or corporation on account thereof, or by reason of any injury or damage caused thereby.

X. No permission to erect or maintain such poles or wires shall be granted except on written application to

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the city council, and every such application and every permission given, shall designate the streets, squares, lanes or alleys in, over, or under which it is proposed to locate the same, and before action thereon by the city council, said applications shall be referred to the city engineer for his examination and report; and every such application shall be referred to a committee with instructions to give a public hearing thereon.

XI. All poles used for telegraphic or telephonic purposes shall be branded or otherwise marked in a legible and permanent manner, to the satisfaction of the city engineer, with the name, or title of the person or corporation owning the same, and at his or its expense. And in all cases where wires of more than one person or corporation are placed upon any one pole, that part of the pole or cross-arm to which such wires are attached shall be marked in such manner as to designate the ownership of said wires, and in such a way as shall be satisfactory to the city engineer.

XII. Chapter CCIII of the ordinances is hereby repealed.

No. 178. An Ordinance Regulating the Erection and Use of Wires Conducting Electricity for Light, Heat, and Motive Power.

[Approved April 24, 1884.]

It is ordained by the City Council of the City of Providence as follows:

The following regulations are hereby established for the running of wires in the City of Providence, to be used for the purpose of conducting currents of electricity for the transmission or production of light, heat, or motive power.

I. No such wire shall be placed or maintained in or over any street, square, lane or alley in the City of Providence, without permission of the city council, nor until the person or corporation placing or maintaining the same shall have filed with the city clerk a written agreement accepting and promising to abide by and perform all the conditions and provisions of this ordinance and of all ordinances or orders in amendment of or in addition hereto that may be hereafter enacted.

II. All such wires, when placed above the surface of the ground, shall be suspended from poles which shall be provided and maintained by the person or corporation using such wires.

And such person or corporation shall permit any other person or corporation to suspend from such poles, wires for conducting electric currents for lighting, heating, or motive power, and also to place lamps on any poles or lamp posts not in use for that purpose, whenever the city council shall so direct, and upon such reasonable conditions, terms and remuneration as the city council may approve or prescribe.

Said poles shall not be used for the support of, nor shall said wires be placed in contact with, any telephonic, telegraphic, or other wire; and such poles shall be so placed that the wires shall cross streets only at right angles.

III. The poles shall not exceed 30 feet in height from the ground, and the lowest line of wire thereon shall be suspended not less than 20 feet from the ground.

IV. No such wire shall be suspended from or attached to any building, except for the purpose of conducting electricity thereto, unless by special permission of the chief engineer of the fire department, and in accordance with his directions; and in no case shall such wire be placed on any building in proximity to any other wire.

V. Upon the completion of any circuit, and before the same shall be used, a plat showing the location of all poles and wires in such circuit shall be filed in the office of the engineers of the fire department, and any change of poles or wires shall be reported at said office within twenty-four hours after such change shall be made.

VI. The machine generating the electric current shall be insulated from electrical communication with the earth, and the wires shall be covered with proper insulating material throughout their entire length, and shall have no ground connections, the direct and return current being taken over metallic conductors, and the attachments of all wires shall be made of non-combustible non-conducting material.

Daily tests shall be made of each circuit operated to detect defects and accidental ground connections, and reports of such tests shall be made to the chief engineer of the fire department daily.

VII. The location, height, arrangement, construction and attachment of all poles and wires shall be under the direction of the chief engineer of the fire department, who may, at any time, and from time to time in his discretion, direct changes to be made therein, as the public safety may require.

VIII. Permission given by the city council to erect or maintain such poles and wires may be revoked in whole or in part, at any time, and any of such poles or wires may be removed by said city, its officers, agents or servants, from time to time, for at any time, without notice.

IX. Every person or corporation erecting, maintaining or using such poles or wires shall indemnify and save harmless the city of Providence, its officers, agents and servants, from and against all lawful claims and demands for injuries to persons or property occasioned by the existence of such poles or wires, or the transmission of electric currents by means thereof, and the said city, city council, or chief engineer of the fire department, or the agents or servants of said city, exercising the rights, powers and permission, and subject to the restrictions respectively given and reserved herein, shall not be held liable by such person or corporation on account thereof, or lay reason of any injury or damage caused thereby.

X. No permission to erect or maintain such poles or wires shall be granted except on written application to the city council, and every such application and every permission given shall designate the streets, squares, lanes or alleys over and in which it is proposed to locate the same, and before action thereon by the city council, said application shall be referred to the chief engineer of the fire department for his examination and report, and every such application shall be referred to a committee with instructions to give a public hearing thereon.

XI. All poles used for carrying wires for conducting electricity for light, heat or motive power shall be branded or otherwise marked in a legible and permanent manner to the satisfaction of the chief engineer of the fire department with the name or title of the person or corporation owning the same, and at his or its expense, and in all cases where wires of more than one person or corporation are placed upon any one pole, that part of the pole or cross-arm to which such wires are attached shall be marked in such manner as to designate the ownership of said wires, and in such way as shall be satisfactory to the chief engineer of the fire department.

XII. Chapters CXCIII and CXCV are hereby repealed.

No. 224. An Ordinance in Amendment of Chapter CCLIII of the Ordinances entitled "An Ordinance regulating the erection of Poles and Wires for conducting Electricity for Telegraphic and Telephonic Purposes."

[Approved May 24, 1884.]

It is ordained by the City Council of the City of Providence as follows:

SECTION 1. Chapter CCLIII of the ordinances is hereby amended, by inserting in regulation X in the seventh line thereof, after the word "engineer," the words "or in case of his absence, sickness or inability to act in the premises, to some one of his assistants in the city engineer's department," so that said regulation shall read as follows: X. No permission to erect or maintain such poles or wires shall be granted except on written application to the city council, and every such application and every permission given shall designate the streets, squares, lanes or alleys, in, under, or over, which it is proposed to locate the same, and before action thereon by the city council, said application shall be referred to the city engineer, or in case of his absence, sickness or inability to act in the premises, to some one of his assistants in the city engineer's department, for his examination and report, and every such application shall be referred to a committee with instructions to give a public hearing thereon.

No. 245. An Ordinance relative to the Erection of Poles on the Streets or Sidewalks of the City of Providence.

[Approved June 19, 1885.]

It is ordained by the City Council of the City of Providence as follows:

SECTION 1. No pole shall hereafter be erected for the support of wires for telegraphic or telephonic purposes or for the support of wires for the purpose of conducting currents of electricity for the transmission or production of light, heat or motive power, on any street or sidewalk in the city of Providence, unless a plat shall be presented to the committee to which the application for the erection of such pole shall be made, which shall designate the street on which, and the place thereon, and the lot or lots, containing the owner or owners' names therein, in front of which said pole is to be erected.

SEC. 2. The committee appointed to give a public hearing on any application made as aforesaid, shall, at least six days before the time designated by it for such public hearing, cause a notice of the time and place of such hearing thereon, directed to the name of the place where such owner resides, if known, to be deposited in the post office in said city of Providence; but no failure or omission to receive such notice so mailed as aforesaid, shall effect the validity of any subsequent proceedings relative to such application.

SEC. 3. Any permission hereinafter granted for the erection of poles in the streets or upon the sidewalks of the city of Providence, for any purpose whatever, shall be void unless the privilege granted thereby shall be exercised within the space of six months from and after the date of the grant of such permission.

The city of Providence does not claim or reserve any right-of-way for its own wires on the poles of private corporations using streets. But the private companies generally give this privilege for fire-alarm wires without opposition or expense, and the fire department reciprocates.

The position of the poles on the streets is determined entirely by circumstances; on curbed streets they are usually near the edge of the walks, and on uncurbed streets sometimes near the fences. The total number of poles, and the miles of wire in use is not on record. As to length of poles, all used for eletric light must be not more than 30 feet high; and as defined in the ordinances, wires for any use must not cross streets in the "first building district" diagonally unless supported by poles long enough to carry them higher than the tops of buildings. The control of all poles and wires is absolutely in the hands of the City Council who partly deputise this control to the City Engineer.

House Numbering.—As far as practicable new streets are numbered from east to west, and from south to north. Even numbers are on the right hand, and one number is allotted on each side to every twenty linear feet.

TO BE CONTINUED.

The River Seine.*

BY LEVESON FRANCIS VERNON-HARCOURT, M. A., M. INST. C. E.

(*Continued from Page 39.*)

DISCUSSION.

MR. L. F. VERNON-HARCOURT.—In France, every year something was done to improve the depth and capabilities of canals and rivers, and most of the works described in the paper had been executed within the last twenty-five years, so that the advance of railways in France had not at all stopped inland navigation works, as it had to a great extent in England. The chief advantage that France had was that the inland-navigation works were under the control of the Government, and that their expenses were paid out of the taxes. He wished to remind the members that there was another democratic country, the United States of America, in which the same system prevailed, the improvements in the rivers, and some of the canals, being executed at the expense of the nation. If it was possible for engineers by training-works to fix and improve the low-water channel of the river, and at the same time to admit the full volume of tidal water up the river as before, then training-walls would be almost excellent things, and very much better even than they now were; but unfortunately, when a river was regulated by training-walls, especially when the tidal flow brought up silt and sand, then in dealing with training-walls, not merely the low-water channel, but the high-water channel also had to be considered. He might mention the case of the Ribble estuary, which in many respects was similar to the Seine. Fig. 1 showed the training-walls that had been carried out in the Ribble. As in the case of the Seine, they had produced accretion. There, as in the Seine, the estuary was funnel-shaped, and it had been found that the training-walls were not carried far enough, and it had been unnecessary to get authority to extend them farther, as shown by dotted lines on the plan. Unfortunately, unlike the Seine, the Ribble had a very small basin, about 800 square miles in area instead of 30,000, so that much less fresh water was discharged. Moreover, the training-walls, as authorized, would not be prolonged far enough to reach deep water; and it would be necessary at some future time to apply for a prolongation, as in the case of the Seine. In the proposals for improving the Seine outlet, the training-walls were widened out considerably; whereas it would be noticed that in the Ribble the training-walls were taken to one side, and that very little widening-out was proposed.

MR. W. SHELFORD remarked that the Seine had been for many years represented as a river which had been improved by large works, which works, however, had resulted in a deterioration of the estuary. Taking a broad view of the general result, it amounted to this, that the channels of the Seine had increased in depth

*Read before the Institution of Civil Engineers, February 16, 1886.

considerably, and that that increase in depth had been accompanied by a diminution in width and a considerable reduction in t dal-capacity. But that was not an unusual thing. Nature had brought about the same result in the Humber. The channels in the Humber were now narrower and deeper than ever, and that narrowing and deepening had been accompanied by a considerable reduction in tidal-capacity. On the Thames the same thing had been brought about by nature and art combined, and on the Clyde art had accomplished a similar result. In fact, it was not, he thought, too much to say that in the case of all tidal-rivers where there was an increased depth in the navigable channel, it was accompanied by a diminution of width, and as a rule by a reduction of the tidal-capacity.

MR. E. LEADER WILLIAMS thought that English engineers might learn a lesson from the fact that the French engineers did not put the lock-sills down low enough. The original locks had 5½ feet of water over the sills, but in a comparatively short space of time they had to be deepened to 6¾ feet, and the question was not being debated whether they should not be at a still greater depth. A lesson had been given by French engineers that was learned on the Severn, namely, that

RIBBLE ESTUARY. Scale 1/50000.

it was no use, after getting out of the tideway to the upper reach of a river where the fall was considerable, say, 12 or 15 inches in a mile, to think of dredging only. It had been tried on the Seine and on the Severn, and had failed. In an ordinary river there was a succession of pools formed by the shoals below, and if these shoals were dredged, the pools were merely lowered but the navigation was not improved. It was necessary to substitute for the natural shoals something else, and the French engineers on the Seine, like the English engineer on the Aire and Calder and on the Severn, had properly substituted weirs and locks. It was satisfactory to learn that the trade on the Upper Seine had doubled between 1868 and 1884. A navigation could be made to prosper, only by increasing the size of the vessels which plied on it; the expenditure did not grow in the same proportion. There was the advantage of a permanent way that did not wear out; and by increasing the sectional area so as to enable vessels of larger burden to pass with facility, the cost of transit per mile was diminished, and it was possible to compete successfully with railways. He admitted that any engineer, on an estuary like the Seine, full of silted matter, who raised a training-wall above the level of high-water, and tied that wall into the side-banks in the way that all the Seine training-walls had been tied, made an ordinary and natural trap for the deposit of silt; and on the Dee, where he was engaged in carrying out some works, that result had also followed. Telford, and other engineers who had designed the training-walls on the river Dee, had done so with the avowed object of making accretion, and reclaiming the land; the engineers on the Seine had done the same, and they had achieved their object, and paid for the works out of the lands they had made without damage to any one. He had been very much struck with some evidence that had been given by Mr. Thomas Stevenson, M. Inst. C.E. He was asked how many rivers he had improved, and he mentioned a large number. He had carried out training-walls, he said, in many of them, and accretion had followed; but it had not interfered with the improvement of the river, or caused shoaling at the bar in any single instance. It was impossible to put the case stronger than that. There was one point upon which they had been absolutely consistent and unanimous, and that was in the declaration, that in treating of improvements in rivers they ought not to be dogmatic; because no two rivers were alike. Their profession was too grand to be trammelled in any such way. He hoped that the younger members of the Institution would always bear that in mind. All rivers should be studied, and having brought together all their knowledge from actual experience and reading, they would be better able to lay down correct lines for the improvement of a river or an estuary.

G..N. RUNDALL, B. E.—There was one point which had not been noticed in the paper, and to which extraordinary and exceptional floods might be due, namely, the configuration of the basin itself. When the catchment-basin of a large river assumed the form of a parallelogram, being long and narrow, if the storm producing the rainfall struck the lower end of such basin and travelled up it, evidently the tributaries at the lower end would run off a greater portion of their volume before the tributaries on the upper part of the river nearer the source were even filled; therefore the flood-volume of the whole basin did not arrive simultaneously at a particular point. In the case of a basin whose length and breadth were more nearly equal, a storm striking the outer part on one side would take some time to travel across to the other, and therefore the floods in those tributaries first affected would commence to contribute their portion, but the distance not being so great that the whole volume could have time to run off, they would arrive at a certain position on the main river, such as Paris on the Seine, more simultaneously. The catchment-basin of the Seine above Paris, which had two main tributaries that fed the main river itself, was nearly circular, but suddenly narrowed there, so that if Paris were taken as a center it resembled a sector of a circle with a radius of 150 or 160 miles. Paris itself was nearly equidistant from the two extremities, and consequently the volume of water which had to run down the tributaries would arrive almost simultaneously at Paris, were it not for other considerations connected with the strata. But supposing a storm to strike the circumference of the Paris basin it would have to travel across to the other side before the whole effect of it would be felt. In the case of cyclones in India it had been found that those storms gyrated on their axes sometimes at the rate of 100 miles an hour, whilst their onward course was at the rate of not more than ten miles an hour. Consequently if such a storm occurred on the Seine basin it would take fifteen hours to travel across to the other side. If such a thing as a cyclone did occur there, or a very heavy rainfall, he doubted whether the main river could carry the water off at Paris, but fortunately, in temperate countries cyclones did not occur, and it was seldom that there was a very heavy fall of rain simultaneously over such an area as even 31,000 square miles.

He might be permitted to refer for the sake of comparison to two rivers in India. The basin of one of them, the Mahanuddy, in the province of Orissa, somewhat resembled that of the Seine, but was on a larger scale. It had a course of about 500 miles from its source to the sea, and a basin of 45,000 square miles. A curious feature about it was that its tributaries partook more or less of the same shape as the whole basin. The floods which occurred on that river were very heavy. The Mahanuddy, after collecting all the waters brought by its tributaries, ran through a long and narrow gorge flanked by high hills, and when it arrived at the end of the gorge, it precipitated the whole of its volume on to the delta, where it was carried off by several effluents. When storms occurred which affected only a portion of its tributaries, the rivers in the delta were able to carry them off, but in a great storm, like that in 1868, which traveled across the basin, the delta rivers were not sufficient to carry off the whole volume, and tremendous devastation occurred from the floods, thousands of square miles being inundated. Of late years effective embankments had been constructed, and a great portion of the country formerly liable to be flooded was now protected. The great rainfall in 1866 occasioned a flood which lasted about ten days, and during that time 22,500 million cubic yards were discharged, equivalent to a rainfall of 6 inches over the whole area. After the tenth day, instead of the river continuing to fall, it began to rise again, and it rose to within 6 inches of the previous level; the duration, however, was only four and a half days, and the total volume of water discharged during that time was about half that in the former flood. The rain that fell was at the rate of 1 inch per day over the whole basin. It was impossible to tell the exact proportion that flowed off, because it was on such a large scale.

That case was almost parallel to the instance cited by the author, of the Seine flood in 1883, as consequent upon two heavy falls of rain following close upon each other. The other river to which he had referred was the Damooda, the shape of which was nearly parallelogram, whose lengths was 220 miles, average width 35 miles, and area 7,200 square miles. In 1856, which was a year of exceptional flood, there was a rainfall of 5.50 inches in one part of the basin, varying to 1.80 inch in another part, in twenty-four hours. The character of the river was torrential; it had a slope from 40 feet three and a half miles, and that slope gradually decreased to 2¾ feet per mile when it reached the gauge which recorded the height and fall of the river. The gauge was about sixty miles above the confluence of the Damooda with the Hooghly. The flood reached that gauge in twenty-four hours. Its total duration was three days, but the maximum height lasted only about three hours. The total volume which passed in the three days was 2,500 millions cubic yards, equivalent to a flow of rain of 4.10 inches off the whole area; whilst the total rainfall, as far as it could be ascertained, was about 11.10 inches over the basin. The rain-guages, however, were too few in number to enable any accurate inferences to be deduced, so that when averages of rainfall were spoken of as regulating floods, it was necessary to be cautious in ascertaining how far they had been obtained from a sufficient number of guages. As to the prediction of floods by the heights of tributaries feeding the main river, he did not think that that would be practicable in India, because the sources of these large rivers lay in uninhabited forest tracts of a deadly character, so that there was no possibility of ascertaining the height of the tributaries. But on the large rivers like the Mahanuddy, there was telegraphic communication, so that it was possible to know when the maximum flood was passing certain points, and when it might be expected at the head of the delta, which was the crucial point of the river. The question of wave-propagation was an interesting one, but it had not yet been well worked out. He was surprised to find from the paper that the speed of the wave of propagation on the Upper Seine was 5.72 miles an hour, as the rate of its traveling from the extreme point Clamecy to Mantes, 228 miles, ranged from 2.00 to 2.21 miles per hour, which seemed to correspond to what had been observed in India.

MR. J. N. SHOOLBRED.—The longitudinal section (Plate 4. Fig. 2) of the part of the river from La Mailleraye to the sea, was in his opinion liable to convey an impression of a most marked improvement having taken place, not merely in the deepening of the bed, but also in the general condition of the river since 1824. That longitudinal section should, be considered, have been extended up to Rouen, near to the head of the tidal establishment of the river, as was shown in the one submitted by himself (Plate 5. Fig. 13). It would there be seen, that in the upper part there had been no similar artificial deepening of the river-bed. In fact, the excresence in the river-bed, in 1814 and until 1853, between La Mailleraye and the sea, must have had the effect of a huge dam in penning in the water between La Mailleraye and Rouen. The effect upon the tidal-action, consequent upon the removal of this dam, was detailed, in part in the paper. But to understand the changes more fully, there should be shown upon the longitudinal section of the river a comparison of the high-water and the low-water levels respectively before as well as after the lowering of the river bed (Plate 5. Fig. 13). It would be there seen, amongst other matters, that the ebbing tide, from the upper part of the river, had before the dredging been practically dammed back until reaching Tancarville, almost at the Estuary itself; into which it then poured down a steep incline, and consequently with very considerable scouring-power. Now, however, since the lowering had been effected, the discharge of the tide took over a much gentler and more lengthy incline, and practically with the same head from La Mailleraye, instead of from Tancarville. The distance in the latter case to Berville being but seven miles as against twenty-eight miles in the former case. No accurate estimate of the state of the river could be formed from the longitudinal section alone, without taking into consideration the cross-section thereof at various points.

A series of comparative cross-sections of the river, extending from La Roque to La Mailleraye, were taken by the engineers of the French Government in 1850, and again in 1867; before the commencement, and after the completion, of the river walls. A certain number of these, taken from the most important ones, were shown as sections D, E, F, G, and H, and were shown in Plate 5, Figs. 8, 9, 10, 11 and 12. There were also shown some other sections, A, B, C, Figs. 5, 6 and 7, extending at intervals down the Estuary from the termination of the river walls to the neighborhood of Havre. The periods of comparison for these estuary sections were 1863, shortly before the completion of the river-walls, and 1880, the last complete survey of the

(Continued on page 60.)

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We publish this week a double page illustration of the Details of the draw span of the Harlem River Bridge connecting the Suburban Rapid Transit R. R. with the Elevated R. R. System of this city. Further details, and specifications will be published next week. Every copy of ENGINEERING NEWS *should have this illustration this week*

WE have decided in future to make our building news a more conspicuous feature in this journal and have entrusted this department to the care of Mr. T. H. Boorman, a member of the "Mechanics and Traders" and "Building Material" Exchanges. While endeavoring to obtain personally all information of interest to Engineering and Building communities he will be glad to receive any news which may not come under his direct observation.

A CONVENTION for the purpose of considering measures for the improvement of the Canals of the State of New York will be held in Syracuse on the 25th of August. A general invitation to all parties interested in the subject has been issued, and delegates representing trade, agricultural or labor organizations are asked to be present and take part in the discussions. The president of the "Union for the Improvement of the Canals of N. Y.," is Horatio Seymour of Utica, formerly State Engineer; the Chairman of the Executive Committee is Congressman O. B. Potter; the office of the Union is 55 Liberty St., N. Y.

THE Institution of Civil Engineers have so far adopted and endorsed Mr. Dorsey's paper "English and American Railroads Compared" as to print a lengthy abstract of it among their "Selected Papers" (papers that are not to be discussed) giving it a regular number among the papers of the Institution, which is seldom done to papers not originally presented except in the case of Government reports.

This endorsement of the soundness of Mr. Dorsey's data and the conclusions deduced therefrom, coming as it does from the Institution whose members are the best qualified to judge of the only points that can be in dispute, i. e., the estimates as to freight and passenger mileage rates, must not only be very flattering to the industrious author, but may allow our esteemed contemporaries, who have hitherto feared its publication would be "offensive to England," to notice its conclusions.

THE *Financial News* of London has the following:

PARIS, July 5.—The Committee of the Chamber of Deputies on the Bill authorizing the issue of a lottery loan for the Panama canal scheme, to-day heard the evidence of M. de Lesseps, M. Jacquier, chief engineer of bridges and roads at St. Etienne, recently appointed director of the works of the canal, and M. Dingler, engineer. M. Jacquier declared that in order to keep within the limits of time and expenditure assigned by the company, it would be necessary to construct the canal with locks, and not at a uniform level. M. de Lesseps stated that it would be possible to complete a level canal within three years at a cost of 600,000,000f.; but added that he had not yet come to any decision and would act according to the requirements of science. He observed at the same time, however, that a canal with locks being necessarily temporary in its character, a level canal would ultimately have to be constructed. M. Dingler stated that he had calculated that the annual receipts of the canal when fully opened for traffic would amount to 150,000,000f., at a rate of 15f. per ton.

The committee then adjourned until Thursday next.

The lottery scheme for still further depleeting the pocket of small French investors, having failed to receive the consent of the French Government, M. Leroy-Beaulieu thinks that the enterprise is too great for the means of any private company, and proposes a syndicate of the United States, England, France, Germany, Italy, Holland, Russia and Spain to complete the canal.

In the meantime de Lesseps is proposing to issue bonds at 45 per cent. of their faces hoping to raise money enough to push the canal so far forward that the French will authorize his lottery scheme.

While no one can regard the great loss of capital on the Isthmus of Panama complacently; it is better for this country that the first canal is built further north.

ACCORDING to *Bradstreets* a meeting of delegates for the principal continental countries has lately been held at Vienna to discuss the promotion of inland shipping in Europe.

The Congress recommended that the junction of the middle European rivers by canals should be carried forward, that the dimensions of the canals and locks should be uniform and larger than at present so that the steamers used on the rivers could be used on the canals, it being asserted that the experience of the railroads parallel with the Rhine and Elbe shows that they have nothing to fear either as to their profits or capital from the competition of inland shipping.

A reference to the very full review of Sir Charles Hartley's paper on "The Inland Navigation of Europe" in our issue of Feb. 6th, last will show the rivers and canals that were under consideration.

Following the concluding sentence which reads "The Proceedings of the Congress illustrate again the strength of the tendency towards closer communication, particularly in commercial matters, which is one of the striking features of the times," is a paragraph on the River and Harbor bill demanding $1,000,000 for the improvement of New York harbor, which is declared not local, "but of national importance owing to the relation in which the metropolis stands to the country at large." also "It is unfortunate, however, that the appropriation forms part of an extravagant bill whose approval by the President in problematical." From which it would seem that *Bradstreets* holds that the relation in which the metropolis stands to the country at large is entirely different from the relation in which the country at large stands to the metropolis, and that "the tendency towards closer communication" among the people whose money is to be expended is not to be gratified, or at least its gratification would be extravagant.

For a few years New York might continue to grow with the production and distribution of the country at large as seriously hampered as many New Yorkers seem to wish, as a mill might continue to pay dividends after the sale of its machinery and outlying lands by borrowing money on its buildings, but the prosperity of this city as well as that of the country at large depends greatly on cheapening the distribution of the products of its industries.

Now whether that cheapening is effected by improving the bar at Sandy Hook reducing ocean freights, by deepening the Kanawha from 2 to 6 feet and more than doubling the shipments of coal, long before the improvement is complete, or by enlarging the Sault Ste. Mary canal, so that the saving on the freights of Marquette alone amounted in four years to more than three times the cost of the enlargement; these improvements whether in one place or the other increases the wealth of the whole country.

We quoted, June 19th, Senator Miller of this State, who said "New York can get this appropriation * * * * or she can let it alone and go on fighting the River and Harbor bill, which will be passed whether she fights it or not." It seems so far as the action of the Senate is concerned, that we will both fight and get our appropriation, but if the New York papers, instead of perpetually indulging in wholesale denunciations of the River and Harbor bills, would carefully point out their objectionable features, if they have any, abstaining at the same time from billingsgate, the harbor would receive some of the attention it deserves, and Congressmen would no longer assert that there are no country newspapers with less influence in Washington than the New York dailies.

Cast and Wrought-Iron Pillars.

The Berlin police having prohibited the use of cast-iron pillars in warehouses (as it was found that they cracked and broke under the application of water, when red hot), and ordered the use of wrought-iron instead, Professor Bauschinger made some experiments on different pillars, showing that Portland cement stood better than granite, limestone or sandstone, and that cast-iron stood better than wrought-iron. Both, where heated, bent towards the fire and the application of water was more dangerous to the wrought-iron columns than to the cast-iron ones, unless both ends were free. The cast-iron columns also regained their shape on cooling better than the wrought-iron.

Our underwriters consider a solid pitch pine column the safest, not that it will not burn, but that it burns slowly and the heat does not soften it, nor does water make it brittle,

PERSONAL

HENRY M. PATTERSON, who served as chief clerk to Chief Engineer Church, of the new aqueduct, died at Yonkers on Sunday, July 18.

MR H. H. FILLEY formerly Acting Chief Engineer, was appointed Chief Engineer Southern General Division, Mexican National Railway, January 1st 1886. MR. FILLEY is now on a leave of absence of a few weeks.

GEO. W. PEARSONS, Engineer for the Kansas City Water-Works, is in town, this week, on business relating to the purchase of engines for the new pumping stations in that city. He is at the Astor House.

THE reorganization of the Engineering Corps, of the New Croton Aqueduct, into five divisions to be in charge of the principal assistant engineer and five assistant engineers was discussed by the commissioners on Wednesday.

IN the Senate on the 10th of July MR GIBSON said: "I am informed by a high authority that there never has been an embezzlement, a defalcation, or the loss of one farthing of the public money expended by the Engineer Corps of the Army of the United States. I state this because I think it indicates the high sense of honor that ever pervades that department of the service of this Government.

Executive Engineer A. FTELEY, of the New York Croton Aqueduct Commission, who some time ago sent in his resignation, which the Commissioners declined at accept, requested a leave of absence without pay. The Commissioners, on Wednesday, accepted the resignation, appointed MR FTELEY consulting engineer and granted him leave of absence until his health was restored. Consulting Engineer Jos. W. DAVIS resigned and his resignation was reluctantly accepted.

AT a meeting of the Directors of the New York Arcade Railway Company an Executive Committee was appointed as follows: Ex-President Chester A. Arthur, Cornelius S. Bliss, Melville C. Smith, W. H. Wickham, John O'Brien, E. V. Thomas, and George Cecil. Ex-President Arthur has signified to the Directors his intention to accept the Presidency of the company. The company has not yet decided when the work on the road will begin.

THE Directors of the New York Cable Railway Company have appointed President William S. Williams, Wallace C. Andrews, Homer A. Nelson, Roland N. Hazzard, and Joshua B. Shaw members of the Executive Committee. The company will take the suit to determine whether it has the right to build surface roads in this city direct to the Court of Appeals.

MR. D. MCN. STAUFFER, of this journal, after a visit to the most noted cities of Holland and Belgium, along the Rhine and in Switzerland, as far south as Milan, Italy, and Paris, returned to London on the 8th. He will visit the Forth Bridge in Scotland at the end of this month, and as the guest of Mr. George S. Deacon, Borough Engineer of Liverpool, will spend several days inspecting the great Vyrnwy dam and other works of the new water supply of that city, sailing for America by the *Celtic* on August 5th. MR. STAUFFER has had a delightful trip, and we expect his note book will be full of interesting matter for future use.

J. R. ADAMS, Assistant Superintendent of Bridges and Buildings of the Galveston, Harrisburg and San Antonio Railway and branches, has had his jurisdiction extended over the Morgan and Victoria division of this system, with the title of Superintendent of Bridges and Buildings of the Atlantic system, with headquarters at Algiers. E. G. THOMPSON, owing to poor health, having resigned his position as General Superintendent. The office is abolished, and P. L. QUEYROUZE is appointed general agent with headquarters at Houston, Tex. Mr. Queyrouze will exercise the same authority and have the same control of the company's interest as was formerly delegated to Mr. Thompson, except in matters pertaining to the maintenance and construction of track, and bridges and buildings.

THE ridiculous assumptions of Commissioner of Accounts Shearman, concerning the examination of the books of Commissioner of Public Works Squire, were promptly overruled by Judge Barrett this week. Shearman is not yet so big a man of he thought he was. "Tis true, a pity 'tis 'tis true" yet the much hated Squire is still on top.

American Society of Civil Engineers in Colorado.

Well may they sit and banquet, who show the rule of man,
O'er earth and sea, who with the bridge the rolling waters span.
Who tunnel underneath the sea, who climb like mountaineers,
Who drive the great sea-eagles—the gallant Engineers.

They combat Nature's forces, and earth, and sea, and air,
Find men to bend them to their will who labor everywhere;
They bring the lightning from the sky to grace our chandeliers.
And plough the furrows of the sea—the able Engineers.

Then here's a health to Henry Flad and each engineering star,
To Newton, Greene and Gillmore, these veterans of war;
They civilize in times of peace, and aid when strife appears,
The Titans of our modern times—our Civil Engineers.

Special Correspondence ENGINEERING NEWS

Being in a state of ignorance as regards the ways of actors and actresses, especially the latter, it had always seemed to the writer that the principal object in carrying them in special cars across the Continent had been that they might be properly advertised to the public at large. This state of ignorance had been a state of bliss, the ordinary sleeper having been ample for the frugal wants of this civil engineer, who is narrating. But now all is changed, and it will be years and may be never, before it will be possible to return satisfactorily to the original state of innocence above set forth. The reason is at hand, and lies in the fact that the American Society of Civil Engineers have, by their luxurious method of going to Denver, demoralized, or rather so educated, their members that nothing short of a special train and one fully equipped will ever satisfy this newly created want. Four cars, two of which were hotel cars, and two were sleepers, rolled out of the Grand Central Station, New York, on June 29th. Here again was a happy combination; the two great rival sleeping car companies, the Pullman and the Wagner, influenced by the peaceful character of the American Society of Civil Engineers consented to bury past differences and furnish the train jointly, so that the novelty of a Pullman car and a Wagner alternated, was furnished the Central employés.

The train was run on "limited" time, and it was quite evident that the limit, like that of some small games of poker, was a small one; the speed attained was extremely high and Chicago, 969 miles distant, was reached the next morning, twenty-four hours after leaving New York. The party was there increased by the membership from the northwest, and another hotel car was added to the train for their accommodation. All the Pullman arrangements for the dining cars had been carefully made, and under the direct superintendence of Major Trout of that company, everything worked smoothly, and nothing seemed to have been forgotten. At Chicago, however, we had to part with our genial friend, the Major, and this to our regret, but he supplied us with one of the most careful and painstaking of the Pullman conductors, viz.: Capt. Myrick from the N. Y. L. E. & W. R. R., and this gentleman went the round trip with the party, who will not soon forget how much of their pleasure and comfort was due to his attention and thoughtfulness.

Leaving Chicago as an Eastern City and dropping an hour as a souvenir of our visit, we soon flew westward over the C. B. & Q. R. R. till supper time, when another sleeper was added containing our St. Louis members and those from the south, so that now complete, we were fairly started for Denver with three sleepers, three hotel cars, the party numbering in all about 125. The next morning found us at Pacific Junction, so well remembered by many who had in years past come up there at Mr. Geo. A. Morison's invitation to see the Plattsmouth Bridge, then in a partially completed state, and which we shortly afterwards crossed now standing in its full glory, a feature in the landscape an and enduring monument to the genius of its designer. Most of the party walked across it and enjoyed the examination of its construction. We then passed rapidly through Nebraska and were met at Oxford by the members of the Denver Committee, who came a short distance from home—a few hundred miles, as it were—just to make it pleasant for us. We found sleeping accommodations for them without difficulty, and after a good dinner, we sat down to comfortably discuss the future.

At McCook station, shortly after their arrival with us, we performed a miracle, for we set back the hands of Time. Joshua *stayed* the sun and moon, but he couldn't *set them* back, this pleasure being reserved for the Society of Civil Engineers. We reached McCook at 21.45 o'clock and left there at 20.55. Then for the first time we found ourselves established in the customs of the country, and Central Time became the order of the day, all our New York watches being two hours fast.

Denver was reached in good shape the next morning at 7 o'clock, schedule time, and after a good breakfast, the party strolled around until about 3 P. M., when the first meeting of the session was held. Mr. Robert B. Stanton, of Denver, was elected as presiding officer, and the first paper of the meeting was read. It was on "Excessive Rainfalls," and was written by Major R. T. Hoxie, U. S. A. It seemed, to read such a paper in Colorado, where drought is the prevailing state of things, a good deal like presenting a soldier who had lost both legs, a tract on the "Sin of Dancing." Still it probably didn't do the Colorado people much harm to learn that there were excessive rainfalls and very destructive ones withal.

The paper began by describing the methods of ascertaining and recording rainfall. It then recited some statistics of excessive rainfalls in different parts of the world. The most destructive rains are usually those which fall upon snow when the ground cannot absorb the water. In general the maximum flow of drainage is the most dangerous features of these excessive rainfalls.

The paper was interesting, although it was almost as "excessive" as some of the rainfalls. It elicited some discussion, and afterward the Convention adjourned for the day.

The public exercises and public welcome occurred in the evening at the Tabor Opera House, and the audience assembled and the character of the house were ample indications that the West, in culture and appearance, can keep up with the East. The building is a beautiful structure, tastefully decorated, and will compare favorably with the best theatres of New York. The orchestra was most excellent. In the center of the stage, which was set with a wood scene, was placed a canvas tent, in front of which was the traditionary kettle, hung from three poles over a bundle of fagots, while various engineering instruments were arranged on the stage.

Shortly after 8 o'clock Mr. Robert Stanton, of Denver, who acted as Chairman of the meeting, arose and said:

Ladies and Gentlemen: We are assembled here this evening to welcome the American Society of Civil Engineers to the City of Denver. I take great pleasure in introducing to you the Hon. Benjamin H. Eaton, Governor of the State of Colorado.

Governor Eaton said:

Never before in the history of Colorado have we been honored as we are to-night. Our distinguished guests

are the forerunners of progress and the corner stone of American civilization.

To the American engineers—their science, skill and energy, more than to any other cause, is due the rapid strides that civilization has made during the last half century. You have annihilated space and bid defiance to time. With iron bands you have connected ocean to ocean, and caused palaces to fly on wheels for our comfort and happiness. The world has been illuminated by the fire of your thoughts. Over thirty years ago I was holding a rod and carrying a chain under the direction of one of your honored members, Mr. Blickensderfer.

Owing to a lull in railroad building, I took Horace Greeley's advice and started west to grow up with the country, never expecting to see Ohio's State Engineer again. A few years passed and I found him leading an iron horse across the great American desert and over our pathless mountains, and now he has charge of a herd of them. Judging the future by the past, the dawn of a grander life has but begun. Our hope of the future is in you. Stand by your high calling.

In behalf of the people of the State, I welcome you, and trust that the pleasure of your visit to our commonwealth will be as an oasis; the shadow of a great rock in a weary land; a green spot on memory's brightest page.

President Flad responded for the Society.

Short addresses were made by Mr. Thomas Nichols, Acting Manager of the City; by Mr. Thomas C. Keefer, Vice-President of the Society; by Mr. R. W. Woodbury, President of the Denver Chamber of Commerce, and by George S. Greene, Jr., of New York City, after which the annual address by President Flad was read, which address was published in full in last week's ENGINEERING NEWS.

The next morning the party were first treated to the procession of Sell's circus, (not arranged by the local committee so far as we know, although it marched past our hotel,) and afterwards driven around Denver in carriages and shown its beauties, not its ladies just then,) its resources, its public buildings, its irrigating canals and its cottonwood trees. Like Tarsus, Denver is "no mean city," it is about as lively a place and as enterprising as one can find anywhere. Its inhabitants having gone west to grow up with the country have grown, some of them faster than the country, and we don't refer to one railroad superintendent (who is 6' 7") either; they have grown broad and liberal in their idea and show the true type of noble American manhood with all its tireless energy and unceasing push and activity.

In the afternoon session A. N. Wellington read a carefully prepared and thoroughly illustrated paper on the "American Line from Vera Cruz to Mexico with notes on the best methods of surmounting high elevations by rail." As the speaker was Chief Engineer of the line in question he was necessarily extremely familiar with his subject, and his paper showed much thought and careful study. Any effort to reproduce it would be a lamentable failure unless the illustrations and photographs shown on this occasion were forthcoming; moreover as Mr. Wellington is one of the editors of the *Railroad Gazette*, he will undoubtedly give in that journal the paper in full, and since at this writing, he is absent testing car-couplers it would be manifestly unfair to forestall him in ENGINEERING NEWS. Suffice it to say, the paper was extremely well received and was full of interest. Its discussion was postponed till the evening session, and meanwhile several members of the society prepared a series of questions designed to puzzle the author, but somehow they didn't puzzle as intended; indeed they seemed to partake rather of the boomerang nature, and one learned professor measured his full length (metaphorically speaking) in the rhetorical arena that evening, while Mr. Wellington "came up smiling" and said "next," at least he would have said it if there had been any "next." He looked it and looked in vain.

Sunday was observed in a proper manner; the ladies went to church.

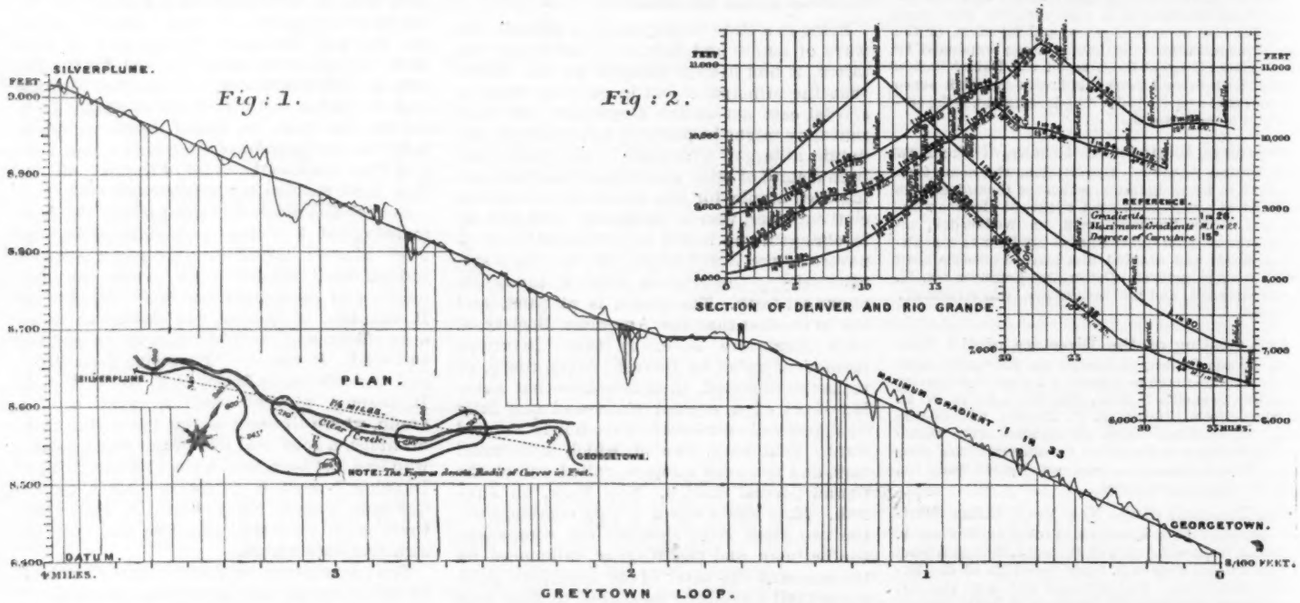
On Monday, while the city of Denver was giving itself to hilarity in celebrating the Fourth of July and the tenth anniversary of the admission of the State to the Union, the Society of Civil Engineers sat through the heat and noise and listened to wise words from its various members.

First came a paper on "Building Stone" by Professor Alexander Julien, of Columbia College. Next, the Society was invited by the Hon. E. B. Washburne to meet in London at the American Exhibition next year. Some of the members feared a representative body of the Society could not be secured—by the way, this term, a "representative body," is a very much abused one, and one which is seldom defined properly; it has great latitude and also contrariwise, has narrow limits; much depends on the definer, so to save further ambiguity the writer will *confidentially* define: a properly "representative body" will hereafter consist of himself and those of his readers who approve of going to London.

The committee on changing the organization of the Society was called, but failed to make a report. The committee was discharged.

The committee on joint libraries also failed to make a report. The same was true of the committee on railroad wheels and rails.

The committee on Compressive Strength of Cements was a notable exception, their report being quite elaborate, and would have no doubt proved interesting if it could have been heard, but between the low tones of the speaker and the noise incident to a mule race under the windows, very little of the report reached the audience. In regard to the other committees, there seemed at one time to be a disposition to appoint new members on them, and the writer, for one, regrets this course did not prevail. What the use is of appointing men on a committee who, either from indifference or want of time, do nothing year after year is a mystery. Or why the members accept the office and are willing to do nothing is another mystery. It is one of the crying evils of the present day, that men are willing to take an office without the slightest idea that it involves any responsibility, but simply with a sort of general feeling that gives them some prestige over their fellows. So it does if the duties are properly performed, but otherwise it reflects a certain amount of discredit on the recipient as a man who promises and fails to perform.



Papers on "The Laying of Masonry in Cold Weather," by Alfred Noble, and "The Strength of Iron and Steel," by H. Marshall, were then read. Mr. Morison gave what the Denver paper called "an interesting description of two voyages across the ocean;" whether he described the scientific sensations of sea sickness or not the reporter did not state. No doubt, he *could* have done so had he desired. "A Novel Application of the Polar Planimeter," was read by Charles E. Emery.

A supplementary paper to those already given on "English and American Railways," by E. Bates Dorsey, was read and "approved." Mr. Dorsey having proceeded to attack the English methods to his heart's content, contrasting their wasteful methods with those of our best railroads, and having failed to elicit any reply, had in the paper in question taken some of our western and southern railroads which had been cheaply built, and hence showed a heavy amount for operating expenses and maintenance of way, and these

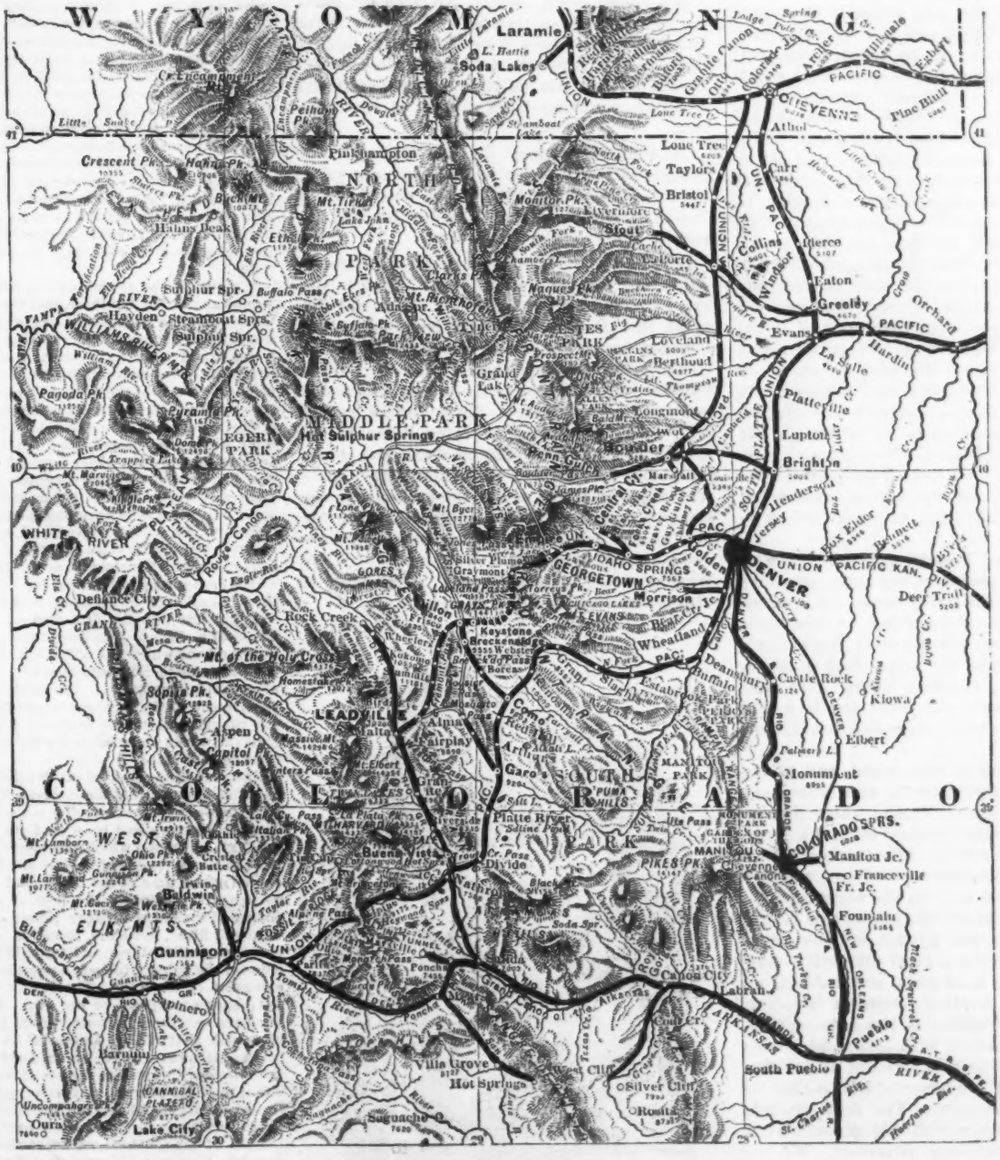
he proposed to contrast with some of the best English railways. By inspecting Table 45 (published in ENGINEERING NEWS, July 3rd), the contrast will appear and in pretty strong colors. Mr. Dorsey is still waiting for a reply and it is hoped he will find, by *careful search*, "a foeman worthy of his steel," and that no more "men of straw" will be set up for him. This paper was very well received but there was unfortunately no chance for any discussion of it, for all present were on Mr. Dorsey's side of the argument, and have long looked in vain for a reply from England. If Mr. Dorsey remains unchallenged, two things seem to be thoroughly established, first, that English engineers must learn the proper method of railway construction from America, and next, that our railway managers can *instruct* them in the proper way to operate a railway after it *is* constructed.

That evening, the Society tendered an informal reception to our hosts, at the Windsor Hotel, and all seemed to have a most thoroughly enjoyable time. The Governor of Colorado was present and the opportunity of making his acquaintance was afforded to the Society in general.

Tuesday, July 6, the Society went, by invitation of Mr. Choate, General Superintendent of the Colorado lines of the U. P. R. R., to Greeley to see the irrigation system. Colorado, be it known, is one of the dryest of countries and this characteristic is developed in its inhabitants. We all realized the remark of "a thirsty land;" indeed the greatest comfort in Colorado is when a stream of something cold is trickling down one's throat. It has been said that a stranger once remarked that, give Colorado an equable temperature and plenty of water it would be a nice place to live in, and he was floored by the reply that the same remark would apply to "Sheol;" however, it was a proper day to see irrigation, and the water companies of Colorado have kindly arranged to run sluices over various parts of the State and furnish water to the thirsty soil, at a fixed price per cubic foot. The farms have an irrigating ditch extending along one side and from this the water runs in channels and rivulets passing between the rows of corn or other products and thus keeping the ground in a proper state of moisture. Each owner pays a fixed price per acre yearly. Governor Eaton has a fine farm at Greeley, and it was visited by some of the party,

Wednesday, July 7th, we started in the narrow gauge cars for Georgetown, and after a beautiful trip through Clear Creek cañon, we came in sight of the town seemingly below us, although we found we had to climb to get to it. We passed around the "loop" of which a sketch is here given,* and went over ourselves and around ourselves and through ourselves and under ourselves till we finally emerged at the Silver Plume, where a beautiful waterfall rewarded the party. Water in Colorado is always a grateful sight, and this cascade was like its name, one of exceeding beauty.

A first-rate dinner at Georgetown rewarded the visitors and we reached Denver in excellent spirits, having had a good view of Golden and of its University, on the trip. On the following day, Thursday, July 8th, the party went to Leadville, and if this view of the cañon to Georgetown was fine, what can be said of the views en route to Leadville! At times we hung over great depths and looking from the car window seemed to be suspended in mid air anywhere from 1200 to 1500 feet above the plains. We were in the heart of the Rockies, and on looking back saw peak after



Map Showing Excursions of the Am. Soc. C. E. in Colorado.

*Proceedings of the Institution of Civil Engineers.

peak behind us covered with eternal snow. South Park opened before us on the descent, extending miles and indeed to the horizon, and passing through it we reached Como, and after dining climbed upwards of 11,000 feet till a summit was reached and all were requested to look back and see the mountain of the Holy Cross some 30 miles off. They did so, and many were rewarded by seeing the outlines of the cross distinctly marked on the mountain side and near the summit. It did not make a bit of difference to these parties when they were told that they had viewed the mountain from the side *opposite* the cross; they still averred they saw it *distinctly*, which proves the mountain to be transparent, and further rather discounts the celebrated painting of "Faith and the Cross." We finally arrived in Leadville, and between a base ball convention and some other gatherings had a hard time to get accommodations; but all finally got under cover from the frost, although in July. No cats disturbed the slumber of the scientists, for, like the sensible animals it is, this domestic pet declines to live at an elevation of 10,200. The following day July, 9, we passed on to the Denver and Rio Grande Railway and commenced our descent. On this trip, the party went through the Royal Gorge, and this was grand enough to repay the entire trip. The cliffs rise up sheer on either side of the track, it is said 1200 feet. As we had not time to climb up and measure, we assume this statement to be correct; at all events it was magnificent to look at, and it is in this gorge that the bridge is supported from the opposite side of the cañon, suspended from a truss, which form of construction is unique.

We next reached Pueblo, and it is believed to be the hottest place on the earth, or under it. At all events, the party broke for cooling draughts and took relays along. As the train left, lager beer went hissing down the writer's throat, and reached the spheroidal state on his tongue. Yet, invalids come here and well they may, for if one *must* die, it would seem as if there was no place one would leave with less regret.

We reached Manitou that night, and *took a bath*. There is far more in this statement than one would think, for the water became ink as the individual stepped in, and a seeming miracle was enacted. After *several* relays of water, it was possible to find out whether we or the water was getting the worst of it.

Chapters could be written about this lovely spot, and someone has written a book about it. The waters are of a most attractive character. One spring is of soda, and bubbles up clear and cool; another contains sulphur, while the most attractive is the Iron Spring. This is highly charged with iron, and comes from the earth at the temperature of ice water; it is so highly effervescent that a glass of it looks like champagne. The soda springs have a fine bath-house with a large swimming bath, some 200 feet long, attached. We realized that if Manitou held the Garden of the Gods, it was likewise the garden spot of Colorado. It is even now with a thrill of extreme satisfaction that the writer contemplates the comforts and attractions of Manitou,—the hotels, the view, the baths, the rides, and indeed all that makes life enjoyable. We spent three short—much too short—days in this delightful spot, went up Pike's Peak, and wished we hadn't, explored Cheyenne cañon, with its seven waterfalls and the grave of "H. H."; rode through Williams cañon, and examined the wonderful cave, which we are told rivals Luray, and which don't compare with it, although very beautiful; and last, but not least, we viewed the Garden of the Gods, where Nature seems to have twisted rocks into all the fantastic shapes that even her ingenuity could devise. The gates to this garden are two huge rocks with spires all along their summit, which are not unlike those of a cathedral, and are called "cathedral spires"; these rocks are quite symmetrical in appearance, and it is difficult at first to believe they are 400 feet high. The view of Pike's Peak as seen through these portals is grand in the extreme, and it looks as though framed for eternity.

Regretfully the party left Manitou, and took our own train for the East.

We rolled along swiftly, covering 400 miles in ten or eleven hours, and finally were brought safely into New York city, having covered as a farewell act one of the last distances of eighteen miles in exactly eighteen minutes, counting from a start at rest to a stop.

All who failed to go on this trip, will, it is hoped be ready to go to London next year, provided we (the members) can convince the Board of Directors that it is for the best interests of all to take this journey.

It is by just such long journeys that friendships are formed and after all, that is the chief object of a Convention. The social element, the development of a friendly feeling between members is the one great object of these meetings, and then think of how a reader, off on board ship would have his audience at his mercy. They cannot get off and walk, and must perforce listen to his article. Just see the chance it will give some members to unload thoughts they have treasured for years, and if the audience is sea sick, so much the better; they can "throw it up" at the reader. All these considerations point to London, and it is to be hoped Mr. Washburne's invitation will meet with a proper consideration.

ALPHA.

For summer reading we give a second installment of Canadian Government Surveys very fully illustrated, representing the trials and tribulations of a Canadian surveyor's life in the back woods. The story will be continued on August 7th, with still more illustrative features, and will tell also of some of the pleasures which lend a fascination even to this laborious and poorly paid service.

(Continued from page 55.)

Estuary. He himself had compiled these estuary cross-sections from official documents of the French Government. An examination of all these cross-sections taken in conjunction with the longitudinal section, showed that, owing to the enormous accretions between La Roque and La Maillerave, amounting to over 20,000 acres, the amount of tidal-water now discharged from the river on the ebb tide was about one-third less than before the works were commenced. While, again taking into account the diminished and at the same lengthened incline down which this reduced amount was discharged, it might be roughly estimated that the scouring-power of the tidal-discharge at Berville now was only about one-sixth of what it had been previous to 1850. With so considerable a diminution in the scouring power at the upper end of the bay, it could readily be understood how those enormous accumulations, covering at least 35,000 acres, had been caused in the Outer Estuary. It was only after the completion of the river-walls, that the improvement in the seaward portion of the estuary had ceased: as evidenced by the relative position of the contour lines, of the deep-water soundings, visible on the charts between 1834 and 1875. From the latter date to the present time the position of these contour-lines had steadily, and at times rapidly, receded seawards. Between 1875 and 1880, the 10-metre contour-line (below the "Zero des Cartes Marines") receded seawards 2¼ miles; the 5-metre contour 1¾ mile, and the 3 metre contour 1⅘ mile.

The author had shown on the authority of Mr. Lavoinne and of Mr. Vauthier, that the low-water area of the estuary had been decreasing steadily since 1875; by which date the diminished scouring-power of the river began to be felt in the estuary. But the most serious of the various results was that now going on in the immediate vicinity of the port of Havre, between the Amfard Bank and the entrance to the port, and westward of the Hoe Point. The accumulations in that region were, during the period 1875-80, at the annual rate of 6,500,000 cubic yards, while between 1880 and 1883, that rate had increased to 9,000,000 cubic yards per annum. Thus during the decade 1875 to 1885 at least 60,000,000 cubic yards had been deposited almost at the very entrance to the port of Havre; and at a rate of deposit which threatened to close entirely the entrance to that important and flourishing port. This was the price which France was now paying for the improvement in the navigation of the Seine up to Rouen and for making that city into the fifth port of that country. In doing this, France was sacrificing Havre, its second port; and one which was of far more importance to that country, and to Northern Europe than Rouen was, or ever could hope to be. Yet, with these facts before them, some of the speakers would fain inquire, Where was the damage to the estuary of the Seine, arising from the works undertaken for the improvement of the river up to Rouen?

It seemed to be admitted on all sides, in France as well as in this country, that the river-walls on the Seine must be extended seawards to the mouth of the estuary. Several proposals had been made from time to time, but that suggestion which appeared to find most favor in France was the one of the late Mr. Lavoinne, who occupied at the time of his death, and had done so for some years previously, the post of chief engineer in charge of the Seine between Rouen and the sea. He was well fitted, therefore, from his position, from his personal qualifications, and from his intimate knowledge of the subject, to form a practical scheme for the extension of the walls. The author had put forth in the paper a proposal of his own. The course of his northern wall there indicated might be said to be identical with that of Mr. Lavoinne—indeed the course taken of late years by the sea-face of the accumulations in the estuary, as well as the set of the flow and of the ebb of the tidal-current of river Seine, almost indicated the convex form and also the direction of this northern wall. But it was in the seaward extremity of the extension of the southern wall that the author differed from Mr. Lavoinne. Westward of Honfleur, the former followed the low-water line, which was pretty permanent, round the coast to Trouville. While Mr. Lavoinne's scheme extended from Honfleur westward into the bay, taking advantage of a ridge of rocks, up to a well-known shoal called the Ratier. His object being to form a breakwater for the interception of the tide-borne detritus, coming from the coast of Calvados and the south-west, and thus to prevent an accumulation of deposit in his newly-regulated entrance-channel to the Seine. The absence of any such precaution in the author's plan was a serious objection to it; indeed there seemed nothing in his scheme to prevent the continuance of the deposits, as at present, on the southern face of the proposed northern wall. The depositing ground, or catchment-basin, clearly intended by Mr. Lavoinne, was the space between Villerville and the Ratier shoal. It was also very doubtful whether a deposit there formed would ever, as the author feared, jeopardize the approach to Trouville, since the tidal-current from the south-west would, when the bank of

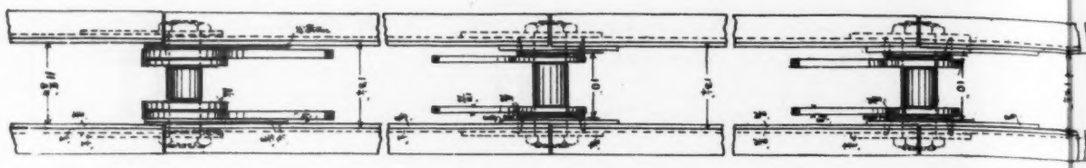
J. J. R. CROES,
Chief Engineer.

DESIGNED BY THEODORE COOPER,
Consulting Engineer.

HARLEM RIVER DR

SUBURBAN RAPID TRANS

DETAILS OF DRAW SPAN (244' 6" CENTRE



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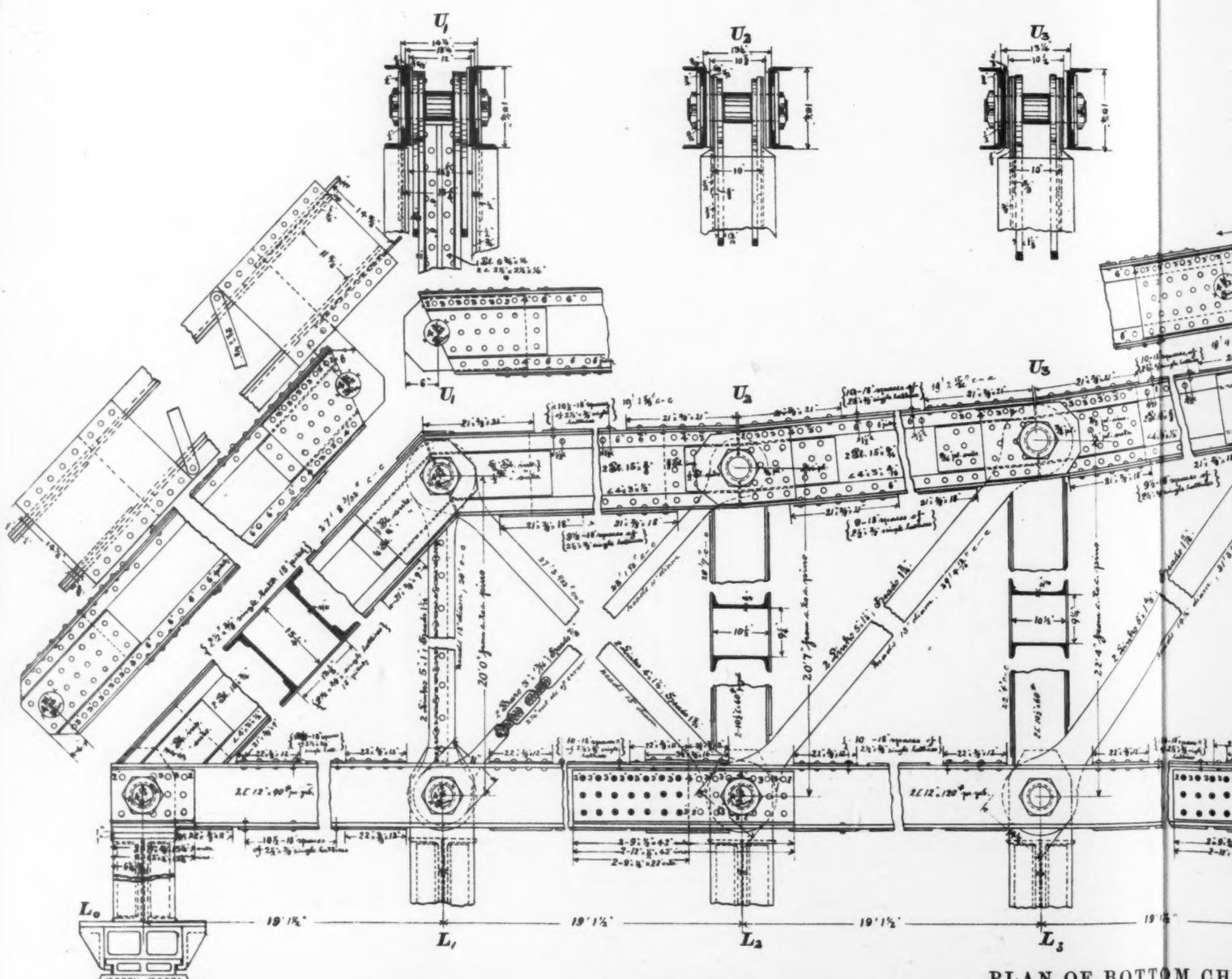

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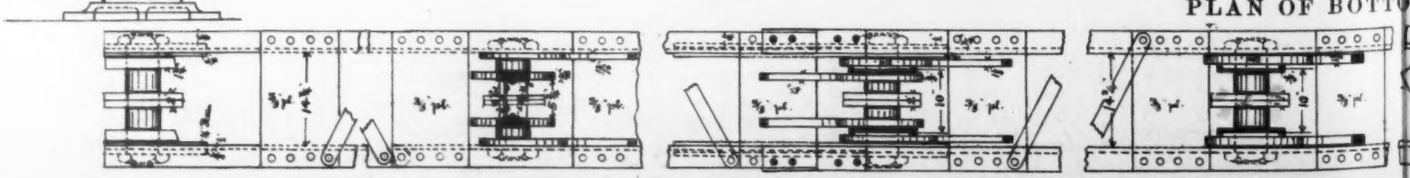

DRAW BRIDGE.

RANSIT COMPANY.

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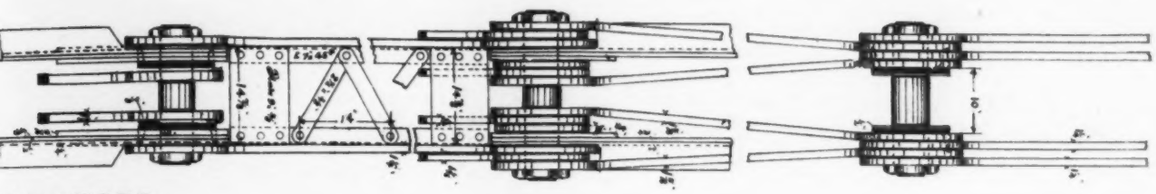
BUILT BY
THE NEW JERSEY STEEL AND IRON CO.,
TRENTON, N. J.
COOPER, HEWITT & CO.,
NEW YORK.



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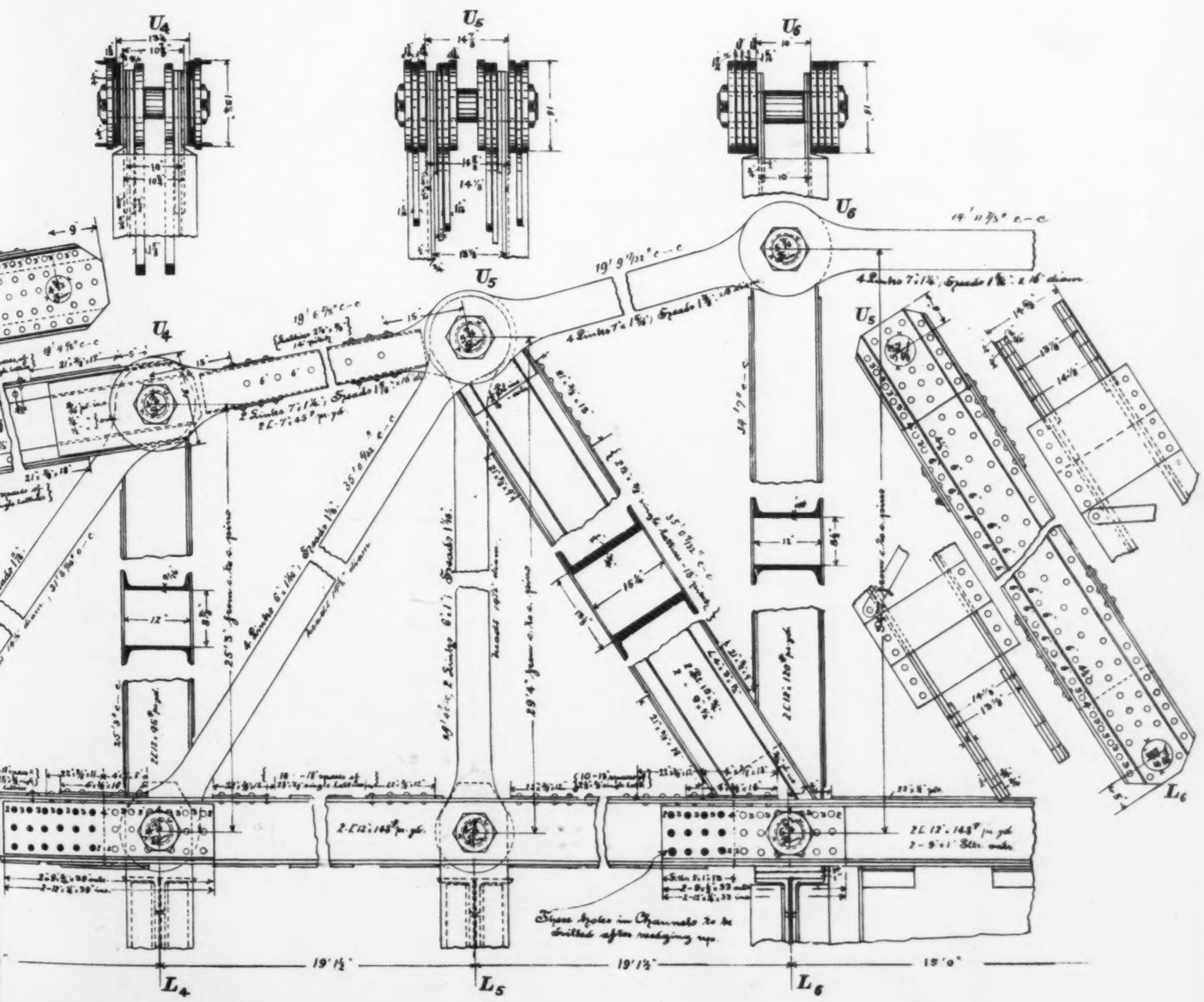

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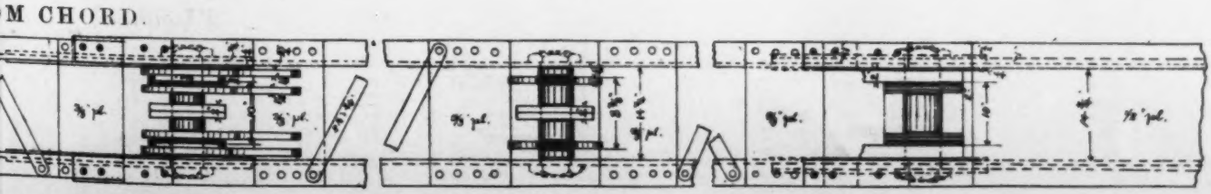


accumulations extended sufficiently seaward, probably sweep on from Trouville and past the seaward end of the Ratier shoal without leaving any deposit. He strongly approved of this part of Mr. Lavoinne's proposal, in contradistinction to that of the author.

Inferences had been attempted to be drawn from the above described operations as to the effect of training-walls upon the Upper Estuary of the Mersey, and the want of similarity of the latter river with the tidal-portion of the river Seine. In such a comparison, however, the present condition of the Mersey, untampered with in the Upper Estuary, should be compared with that of the Seine in 1834 and up to 1850, before the construction of the river-walls (Plate 5, Fig. 1); not with its present mutilated condition, as the comparison was usually made. The conformation of the Seine, in its reaches immediately above the Estuary, would be found, at the earlier date, to present much closer points of analogy with the Upper Estuary of the Mersey than the advocates of training-walls in the Mersey would possibly like to admit.

In his opinion the results arising from the construction of the river-walls on the Seine (results most unfortunate, on the whole, and increasingly so each year) were of a most instructive character to engineers. They pointed out most unmistakably, how ill-judged it was, in tidal matters, to disturb violently the balance of forces which nature had established: and also, how difficult it was—nay, almost impossible, as evidenced by the later efforts of the French engineers—to re-establish that balance, once it was destroyed.

One word on the subject of movable weirs. It was noteworthy in actual practice, to observe the clumsy and tedious operation of the needle-weirs, on the Seine. Take the one at Martot for example. Contrast it with the tilting-weirs of Mr. F. Wiswall on the Irwell, near Manchester, and on the Upper Mersey. In the former case, each needle was separately removed by hand, over the stream itself, along a foot bridge, which remained in floods as a permanent obstruction; while in the latter, the tilting-gates were all controlled and worked from the banks. Furthermore, in case of floods, the gates, if not already opened, were automatically tilted over by the increased weight of water, leaving an unimpeded water-way across the entire width of the river, save for the slight obstruction of the cast iron supporting-frames of the gates. The saving of time in opening or shutting the respective weirs must be immensely in favor of the tilting-weir.

Sir James N. Douglass said the paper was especially valuable as recording another instance of the efficiency of training-walls. Sir James Douglass had had nineteen years' intimate knowledge of the Seine Estuary, and he entirely agreed with the author in the opinion that the extension of the training-walls was necessary, if a deep-water channel from the sea was to be maintained. The proposals for the improvement of the entrance were very conflicting. It was first demanded that deep water should be preserved at Havre, and next that deep water should be preserved at Honfleur; and at the same time it was expected that no accretion should occur at Trouville. That, however, was nearly impossible. All would agree that it was a difficult matter to compare any two rivers, and he believed that the question had hitherto been discussed without really considering the main point namely the connection of the Seine with the sea. In its relation to the English Channel it would be seen that the direction of the discharge of the Seine was exceedingly unfortunate. It discharged in a direction nearly parallel to the coast; it had in advance and opposed to it the land trending out to the northward, and terminating in Cape Barfleur which necessarily caused a shallowing in the elongated bay into which the Estuary opened, because it interfered with the tidal-current and prevented the scour that would otherwise occur. Again, the Seine delivered in the face of the travel of the eroded material of the coast to the west of it. It was well known that a very considerable quantity of material was delivered on the southern area of the estuary, as shown on the present charts. In an old chart, made from surveys taken in 1776, it was shown that the deep water at that time was in front of Honfleur. Where it was then 9 fathoms it was at the present time only 2¼ fathoms. Since that time the deep water had been tending to the northward, and now it would be found by recent charts that the deep water was in the center of the estuary, or nearly midway between Havre and Honfleur. Hence it might be concluded that the training-walls should be carried on nearly in the direction indicated by Mr. Lavoinne. Evidence had been given that a very large amount of material had been brought down and deposited. Where was it to go? There was ample room for it in the channel if it could only be carried there by narrowing the estuary. In doing so no doubt some accretion would follow at Trouville; but surely that was a secondary question as compared with the maintenance of deep water up to Havre, Honfleur and Rouen. He contemplated no difficulty in the problem, nor had he any doubt as to ultimate success. Not only would deep water be maintained, but nothing more would be heard of bores in the Seine.

Mr. Vernon Harcourt said that the navigable condition of the Upper Thames could not be materially improved unless the Government took in hand the inland navigation of the country, a system adopted in France, India, the United States, and other countries. Sir R. Rawlinson's view that such works were generally unremunerative, might be true as regarded private enterprise; but it did not follow that the State would not gain by these undertakings. For the State derived an indirect benefit from the increased prosperity of the nation, and from improved facilities for trade, by the augmentation of taxable property; and this was considered in France, and probably in the United States also, to provide an ample return on the expenditure.

CORRESPONDENCE.

Mr. P. Caland observed that the Seine in so far resembled the Clyde, that on both, the trained lower river ended in an estuary opening into a bay of large superficial extent. The conditions on the Clyde were, however, much more favorable than those, on the Seine, as the depth of water in the mouth of the lower channel of the Clyde had increased since the erection of the training-works, a result that had not, according to the Author, been attained in the Seine. The true nature of the problem did not seem to have been apprehended in France, neither had any general scheme of river-improvement been formulated, and the works were carried out from above downwards (instead of beginning at the sea end and working upwards). It would then have been apparent that the river was very unduly contracted, and that to provide proper space in the trained-channel it should have been widened at the lower end. That the Estuary of the Seine had become decidedly shallower in late years was not, in his opinion, a matter of surprise. formerly the sand and mud brought down by the river-flood was deposited in thin layers upon the ground outside the river-bed proper, whence it was carried seawards and dispersed by the waves during periods of storm and high flood-tides; but since the river-bed, had been narrowed and deepened, the bulk of the transported material was deposited beyond the end of the trained-channel as a compact mass in deep water, where it was no longer susceptible of being loosened by the action of the waves. On the Clyde, if Mr. Caland was not mistaken, extensive dredging operations had been carried out between the training-walls, which had not only prevented the formation of shoals seawards, but had increased the scouring-power of the lower river, with the results of increasing the depth of water in the bay as well as in the trained-channels. On the Seine, on the other hand, since the completion of the works, the deepening of the channel had been left to nature, that was, to the river itself.

The width of the mouth of the channel on the author's plan was far too great, and the funnel-shape necessary in every lower river subject to tidal ebb and flow appeared to him to be better provided for in Mr. Lavoinne's scheme. Whether a widening of the channel above Berville might not result from the works proposed could not be determined without further investigation. True, the difference in width between the proposed mouth and the outer ends of the training-walls was very considerable, but it must be born in mind that before the river works were executed the like difference existed between the mouth and the river ar., for instance, Vieux Port and Aizier, which places, having regard to the entire length of the lower river, were not so very much higher up than Berville.

Mr. Caméré wished to acknowledge the value of the Paper, which constituted a complete and interesting monograph of the basin of the Seine. The Author, at P. 23, expressed the opinion that, "the variety of types adopted within one river-basin has been due to the desire of the engineers in charge of the different sections to devise some new and improved type, and not to the special adaptability of each type to the localities in which they are situated." As the best means of combating this opinion, Mr. Caméré proposed to give a succinct history of these different types of weir.

The brief history given by him of the Seine weirs would show that the aim had constantly been kept pace with the demands of the constantly growing traffic. If engineers still hesitated to pronounce on the arrival merits of the Poirée and Chanoine system as adopted to slight falls, they would nevertheless not doubt that such types were not suited for giving the Lower Seine a depth of 10¾ feet, and also they would perhaps come to the conclusion that the Poses weir, in solving this question, had furnished a practical example of a movable dam of great height, and affording every security for working.

The author's figures in his comparison of the cost of the weirs at Poses and Port Villez, needed to be explained, in order that an exact idea might be had of the expense of such structures. At Port Villez, as at Poses, a solid foundation was only found at a great depth, below the beds of gravel and sand forming the river bottom. In order to be beyond the influence of infiltration it was decided to make the Port Villez foundations 24 feet deep; those at Poses were nearly 29 feet below the surface of the sills of the deep passes. These very costly foundations evidently ought not to be considered inherent to the system.

Mr. J. de Coene presented to the library, as a contribution to the question under discussion, an abstract of his evidence given before the Technical Commission of the Seine, nominated by the French Minister of Public Works; also a report of the Belgo-Dutch Commission, nominated in 1866 to consider the scheme of a weir for the East Scheldt.

From the former of these documents it would be gathered that Mr. de Coene favored the narrowing of the outlet of the river, the conservation of a vast interior estuary forming a powerful reservoir; and the construction of a new and completely sheltered entrance to Havre, of such a character as to give deep-water access to that port at all states of the tide. Mr. de Coene would remark upon the movement of the alluvial matter brought into the estuary by the flood-tide, and afterwards carried away to great depths in the sea by the ebb. The author's figures were significant on this head. In 1834, before the embankments existed, the capacity of the estuary below the zero of the marine charts was 431,000,000 cubic yards; in 1854 it was 387,000,000 cubic yards; in 1869 (the embankments having been completed in 1860) it was 490,000,000 cubic yards; in 1880, 441,000,000 cubic yards. That was to say, in 1880 with the embankments the estuary was more capacious than in 1834 without them; while in 1869, in spite of the embankments, and contrary to the opinions of the Havre engineers, the estuary was deeper than it had ever been. All rivers with narrow mouths had deep channels, all those with wide mouths had bars. There was no exception. The Mersey formed an example, as did the Seine at present. It seemed, therefore, to Mr. de Coene that the paper was not complete as regarded the estuary.

Mr. de Coene ventured also to cite the Belgo-Dutch report. The conclusions arrived at were worthy of remark. It was laid down, for instance—first, that the ebb of a tide carried off more than the flood brought in; secondly, that all efforts should be concentrated in the current of a single channel. Facts supported these conclusions. That was the solution sought in the case of the Seine. In his communication to the Industrial Society of Rouen, he had considered the estuaries of all the great rivers—Gironde, Scheldt, Elbe, Tagus, Foyle and Tay—and the comparison had led him to a conclusion which had not once been falsified.

Mr. John Fowler observed that some of the author's remarks as to the effect produced by the works on the tidal section of the Seine seemed to be open to objection. The results which had followed the works on the Seine were akin to what had followed similar works carried out in a corresponding manner in this country. Experience proved that accretion followed training-walls or groynes, whether transverse or longitudinal, the accretion proceeding with more or less rapidity according to the quantity of solid matter contained in the water, and ultimately rising to within a foot or two of the height of the training-works. When the foreshore was narrow and the lateral currents were stopped, the surface assumed a curved slope from the shore, but when wide the surface was level.

Mr. E. Gablick remarked that the training-walls sketched out by the author in the estuary below La Rille would, from their convexity, evidently throw the channel from side to side of the new estuary, instead of keeping it always acting in one and the same position, and in a direct course to the sea. At Honfleur the distance between the proposed walls was 1½ mile, and at the mouth of the estuary 5½ miles. In the new wide estuary within the training-walls the channel would wander about without improvement, neither kept to Honfleur nor to Havre. The training-wall six miles in length, from Honfleur to Villerville Point, did not exhibit any utility worth the expenditure, for it was parallel with the present shore, apparently exercising no new tidal influence.

Professor Gaudard.—The motion of the tide removed any bar formed of fluvial sediment, not only because it diluted and easily dispersed such material, but because, by mingling with the river-water, it communicated its saltness, and consequently density, to the latter. In a tideless river, on the other hand, it was probable that the heavier sea-water was confined more or less to the lower parts of the estuary. The river-water, in spreading over the surface and losing its forward velocity, allowed the suspended matter to settle. But the example of the Seine showed that, in default of fluvial sediment, there yet remained the sands coming from the sea to be grappled with. The great means of removing these was still the pendulum-like sweeping of the tide, but inasmuch as the tidal broom swept in two directions, it was necessary that the ebb should have greater force than the flood. Velocity was required sufficient to remove sand-banks without at the same time being dangerous for navigation. In default of a sufficient excess of power of the ebb, the estuary would get choked up by the sand-bearing waters during storms, depositing their burden in places where the cross-action of contending waters destroyed their velocity; and it necessarily required

more power to uplift and impart motion to matter once deposited, than to keep it in motion before deposit had occurred.

SIR CHARLES HARTLEY, K. C. M. G., having had occasion to study the characteristics of the Seine as a navigable stream, in the preparation of his lecture to the Institution on "Inland Navigations in Europe," could testify to the accurate description given by the author, of the chief features of the Seine, and of the results which had followed the efforts made up to this time to improve its condition as a navigable highway. In considering the improvement of the navigation between Paris and the sea by the valley of the Seine, three separate modes of treatment at once presented themselves to the mind of the hydraulic engineer:—1. The deepening of the bed of the existing water-way by training-works and by dredging; 2. The construction of one or more lateral canals on one side or other of the Seine valley; and 3. The canalization of the river from Paris to Rouen, and thence by a well-trained open channel to the sea. Each of these plans had been attentively studied by French engineers long before the execution of works of any description was decided upon. The first serious project, after Mr. Cachin's, was that of Mr. de Lamblardie, who, in 1773, proposed to cut a canal on the right bank of the Seine between Havre and Villequier, at an estimated cost of £400,000. This canal was designed to have a length of thirty one miles, a width of 121 feet at the water line, and a depth of 20 feet. Half a century later, Mr Berigny was charged by the Government to study the numerous projects which had been publicly brought forward up to that period for the improvement of the Lower Seine, and, having done so, he reported in favor of Mr. de Lamblardie's project. He found it necessary, however, to quadruple the originally estimated, owing to the great changes which had taken place along the site of the canal, and to the great advance in wages that had arisen since the first estimate was made. In 1825, a Government Commission, of which Mr. de Prony was the chief technical member, recommended the execution of a grand project, based on new surveys and data of every available kind, for the construction of a maritime canal between Paris and Havre. The length of this canal was designed to be 182 miles (120 miles from Paris to Rouen, and sixty-two miles from Rouen to Havre); its width, sixty-five feet at the bottom, and its depth of 20 feet. The estimated cost was £8,600,000. In 1840, the execution of this magnificent scheme was arrested owing to the revolutionary troubles, and was soon afterwards completely lost sight of; partly because the contemplated expense was so enormous, and partly on account of the rage for the construction of railways, which spreading throughout France immediately after the first introduction of the locomotive into that country, caused all other public works of magnitude to be neglected for a term of many years' duration. Owing to these circumstances, it was not until 1846, as the author had related, that energetic steps were taken to improve the Seine below Paris. Since that period to the present day, large sums had been spent annually on works connected with the canalization of the river between Paris and Rouen; but in the lower or tidal part of the river, the expenditure on the embankment-works ceased altogether in 1870.

As in all river works, it would no doubt be possible, judging by results, to improve on the plan that had been executed for the improvement of the Seine below La Marilleraye. Apparently, for instance, it would have been better to have constructed the walls with greater solidity, and to have widened out the channel more rapidly as it approached Berville, for in the first case the very onerous cost of maintenance, which had been so much neglected, would have been greatly diminished, and in the second, not only would a greater volume of tidal water have been admitted, but a much better start could have been made at Berville, as the author had pointed out, for the prolongation of the walls at the sea. Moreover, the too great contraction of the tidal-space had given rise to undue scour, a circumstance which had abnormally deepened the artificially embanked channel over long distances at the expense of the tidal-capacity of the estuary, although not of its navigable channel. The total amount of scour had been enormous, for, taking the longitudinal section as a basis for calculation, the average lowering of the bed of the trained channel had been about 18 feet. Thus the length of channel being twenty-eight miles from La Piette to Berville, and its average width 440 yards, the amount of silt and sand scoured away and carried into the estuary was 130,000,000 cubic yards, a quantity, it might be remarked in passing, nearly equivalent to, though of course in a great measure independent of, the accretion of 137,000,000 cubic yards, which, according to Mr. Estignard, had been deposited during the period 1866-75, from the end of the training-walls to the meridian of Honfleur. Between the latter and the meridian of Cap de la Hève, according to Mr. Lavoinne, the changes which had taken place during the period 1834-83, had resulted in an accretion of 76,239,220 cubic yards, and in an erosion, principally to the south of the Amfard bank, of 30,772,000 cubic yards; and, in connection with this statement, it should be remembered, although a close comparison of old with recent surveys would lead many experts to form a somewhat different opinion, that both Mr. Lavoinne and Mr. Vauthier (who had carried his investigations for upwards of a mile to the west of Cap de la Hève) agreed in respect to the Outer estuary, that the alterations in capacity by successive accretions and erosions, resulted from variations in the influence of the natural phenomena producing them, and that these changes have no apparent connection with the great alterations which have taken place in the Upper estuary.

It ought further to be noticed in connection with the Outer estuary, that Cap de la Hève and Pointe du Hoc had always been movable points, the first being continually destroyed by the sea, and the second unceasingly ascending the Estuary. In short, general opinion, based on personal observations, seemed to be to the effect that transports of alluvion from the river were of small account in causing the deposits in the outer estuary, and that their chief source was from matter brought in suspension from the south, aided somewhat by the erosion of the cliffs to the north, the latter action being demonstrated by the well ascertained movements of shingle along the shore from northwest to southeast.

With regard to the effect of the works on the tidal flow, Mr. Lavoinne pointed out that the duration of the ebb-tide having been reduced from nine to seven hours above Berville, the velocity of the outflowing current had been considerably augmented, not only between the walls but for a considerable distance below them. He also referred to the advantage of the waters being driven back higher up-stream than formerly by the flood tide, and to the level of low water at Rouen being about one metre lower now than in 1846—results which compensated in a considerable degree, for the great diminution of tidal-volume passing down the estuary. With regard to the present condition of the estuary below Berville, he further remarked that its contracted width, owing to comparatively recent deposits, had also contributed to increase the velocity of the ebb-tide; and that in this way the deposits had played an important part in maintaining and slightly increasing the original depth of the channel. He did not omit to add, however, that the frequent shifting of the navigable channel between the termination of the walls and Honfleur was still a source of difficulty and danger to shipping, especially in foggy weather, and that the condition of this part of the estuary urgently called for speedy redress.

The action of the training-walls in deepening the river between La Mailleraye and Berville (aided by dredging where, as at the Meules bank, the bed of the river was more or less solid), combined with the result of a long series of investigations relative to the regimen of the estuary, induced Mr. Lavoinne to recommend the completion of Mr. Bouniceau's original project as far as the site of the south wall was concerned; to modify the position of his proposed north wall by reconstructing it on a greatly widened out line between Tancarville and Berville; and thence to prolong the north wall on a line gradually widening from 4,000 feet at Berville to 8,000 at Honfleur, and to 13,000 feet opposite Havre; as compared with Mr. Bouniceau's 2,000 feet, 4,000 feet, and 7,000 feet at the same points respectively. In Mr. Bouniceau's project it was calculated that the proposed great contraction of the estuary between Berville and the sea would have the effect of deepening the channel to 26 feet below zero of the lowest low-tide, by increasing the mean velocity of the current between the walls to two knots an hour; but Mr. Lavoinne not only considered it would be impossible to maintain so great a depth, but that the attempt to do so might completely destroy the regimen of the estuary. He was of opinion, moreover, that it would be sufficient for the needs of the navigation if trading vessels were able to ascend to Rouen under the same conditions as at other tidal-ports: in short, that a depth of about 25 feet at high-water of neap-tides; which would only require the lowering of the bed to 4½ feet below zero, would be an ample depth to maintain throughout the channel. With this object in view, he proposed such a width of channel as would ensure a mean velocity of one and one half knot an hour between Tancarville and the Meridian of Havre. Sir Charles Hartley would not presume to criticise the project of the late Mr. Lavoinne, who made, it might be said, the improvement of the Seine the study of a lifetime, but he regretted that the late Engineer-in-Chief of the tidal Seine did not consider himself justified in recommending the establishment of a much greater depth than 4½ feet below extreme low-water between the training-walls. For his own part, he considered that a depth of at least 12 feet below zero should be aimed at, a disposition which would involve the establishment of a somewhat narrower channel, and an extension of the pier heads into deep water: but in his opinion the expense of the additional prolongation of insubmergible walls would be far more than compensated by the greater probability of success, both in an engineering and commercial point of view, which would attend the operation. Apart from this provision to secure a greater depth, he considered the alignment of the walls to be judiciously planned for securing a stable channel, and for this purpose he could suggest nothing better than the continuously concave southern wall from Berville to the sea. This wall, by completely closing the Villerville channel, which now brought in from the south the greater part of the alluvion deposited in the Outer Estuary, would moreover ensure the maintennace of a single channel directed towards the north-west in the natural direction taken by the ebb-tide. Again, the entrance was at a spot where erosion was more marked than elsewhere, and where the "Thalweg" was as deep as at any former period. These great advantages would, in his opinion, be lost if the author's proposed bell-mouth plan below Honfleur were adopted, and he thought therefore that the special but minor advantages, claimed by the author (but which, however, were not admitted by Mr. Lavoinne) in support of his own plan, were an equivalent for its greater inherent disadvantages as an agent to secure a permanent deep-water entrance to the Seine.

Although Mr. Lavoinne advanced many arguments to show that the prolongation of the training-walls would effectually ward off all danger of injurious silting up in the sea approaches to Havre, it was not pretended that otherwise the extension of the embankments would be of any benefit to that port. It was indeed predicted by not a few engineers and mariners, that the completion of the estuary-works would gravely imperil the conservation of the position it now enjoyed of being the second port in France. Nor was it surprising that such fears were entertained, when it was remembered that the draught of vessels trading to Havre was already limited by the depth of water over a wide zone in front of the port, on which there was a depth of only 26½ feet at high water of neap-tides; the range of tide being 24 feet at springs and 12 feet at neaps, and the depth at the entrance to the harbor being only maintained at 8½ feet below low-water of spring-tides by constant dredging.

On the other hand, the fixity of the bed of the sea in the immediate neighborhood of Havre should beget confidence; for, comparing together all the surveys which had been hitherto made, the unchangeableness of the bed of the roadstead was proved beyond a doubt. This happy circumstance was due, according to Mr. Lavoinne, to the complete absence of matter held in suspension by the alternating tidal currents, and to the independence which existed between the travel of the shingle coming from the north, and that of sand and silt from the south. To this exceptionally favorable condition of things he attributed the immutability of the deep sea approach to Havre, and he appeared to have had good reasons for concluding that works, such as he proposed for the improvement of the estuary, would not be prejudicial to Havre so long as the double action of the tides and litteral currents continued to prevail.

If, however, contrary to Mr. Lavoinne's expectations, further investigations should give good grounds for apprehending the consequences of prolonging the training-walls across the bar into deep water it would then be more prudent "to let well alone," and to adopt the safest solution of the difficulty, namely, that of digging a deep lateral ship-canal instead of a barge-canal between Havre and Tancarville, and of restricting the extension of the embankment-works to a judicious *raccordement* of the existing walls with the shores of the estuary in the direction of Honfleur.

Three projects among many others for the improvement of the port of Havre were now being warmly discussed in France—1st, the project of a large body of experienced naval officers, for the improvement of the existing port by the construction of a breakwater to protect the small roadstead and the existing entrance; 2nd, the project of the Government engineers to suppress the existing entrance (which was directed south-west), and to substitute a new one turned towards the north-west, and the creation of a tenth basin by encroaching on the sea. The expense of these works was estimated at £3,200,000; 3rd, the project of Mr. Hersent, which embraced three distinct improvements—*a*. The protection of the small roadstead and the existing entrance by a series of isolated breakwaters, beginning at Cap de la Hève, and extending over a length of 4¾ miles (including the width of the six openings between the breakwaters) at an average distance of 1 mile from the shore to a point due north of the Ratier bank; *b*. A continuation up-stream of the line of breakwaters by the construction of an insubmergible training-wall to a point 1,600 feet immediately opposite Berville, and of a south training-wall from the latter to Honfleur, where the width of the channel would be increased to 5,000 feet; *c*. The construction of an insubmergible wall round the Ratier bank, in order to ensure the deepening of the two channels, by fixing the position of the north and south currents which separated the channels at the present time.

(TO BE CONTINUED.)

NEWS OF THE WEEK.

Contracting.

Sewers.—Bids were opened at Schenectady, N. Y., for 2¼ miles of pipe sewer by Sewer Committee, July 15th as follows:

	8" Pipe.	Excavation under 6'.	6' to 8'.	8' to 10'.	Man-holes.	Flush-tank.
Michael Nolan.....	18c	11½c	27½c	45c	$40.00	$45.00
John McEncroe.....	18	18	25	35	35.00	45.00
Benj. Van Vranken..	18	12	19	75	30.00	35.00

Contract awarded to Benj. Van Vranken.

Bids for 8,000 feet of water pipe laying was awarded to Michael Nolan by Water Commissioners.

Stop-Cocks and Hydrants.—Bids for stop cocks, etc. were opened by the Commissioner of Public Works, New York City, July, 8. The contract was awarded to J. M. Motley at his bid of $13,894; the following are the prices in detail: 12-inch stop cocks, $49.30; 6-inch stop cocks, $23.60; "A" hydrants, $35.40; "B" case hydrants, $75.00; single nozzle hydrants, $53.75; No. 1 stop cocks and boxes, $25.40; No 2 stop cocks and boxes, $20.00. The other bidders were, W. H. Browne, $13,965; J. Jonson, $13,935; Geo. H. Robinson, $14,785.

Curbing, Flagging, Etc.—Bids for curbstones, flagging, retaining wall, etc., (No. 1) were opened at the Department of Public Works, New York City, on July 14th, as follows:

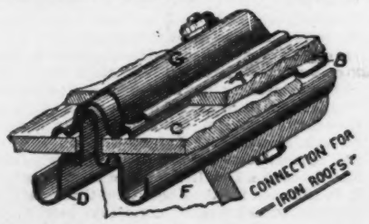
	Earth Excavation.	Rock Excavation.	Filling.	Retaining Wall.	Curb Stone.	Flagging.	Stone Culverts.	Dry Stone.	Cast-Iron Inlet Frames.	18-inch Drain Pipe.	6-inch Drain Pipe.	Total.
Allen & O'Mally	.15	1.30	.10	5.00	.45	.20	1.00	1.00	$10	.50	.10	$ 90,608.35
J. G. Moore.....	.15	1.25	.35	3.05	.55	.20	2.00	2.00	10	1.00	.15	76,806 75
J. Slattery.....	.30	1.60	.20	5.00	.65	.20	3.50	3.50	6	2.50	.75	104,067.95
R. G. McMahon	.20	1.50	.40	5.00	.60	.20	4.00	3.00	10	1.00	.60	106,823.90
J. G. Smith	.25	2.50	.40	4.90	.50	.18	4.00	4.00	3	.61	.12	121,538.70
Geo. C. Clarke..	.25	1.25	.25	5.00	.52	.22	6.00	3.00	8	1.75	.30	99,664.72
J. B. Devlin.....	.30	1.32	.40	6.80	.65	.27	8.00	4.00	8	1.50	.75	129,139.55
F. C. O'Reilly....	.30	1.40	.50	5.00	.90	.20	5.00	5.00	6	1.00	.50	111,142.00
John Cox & Co.	.23	.98	.39	4.32	.89	.22	10.80	10.80	15	2.50	.75	176,218.26
F. Del Genove.	.19	1.34	.25	5.95	.45	.22	2.00	2.00	5	1.00	.50	108,351.98

The contract was awarded to J. Moore.

GLASS ROOFS.

Maximum strength and light with minimum of repairs in glass roofing is a combination which has long been sought for by architects and engineers in the construction of buildings requiring to be lighted from the roof.

This happy combination has been effected in the Helliwell system of puttyless glazing which, for years has taken the lead on the best and most important buildings in Great Britain, and on the Continent of Europe, in many cases even replacing other patented systems. In the annexed cut where *A C* is glass; *B*



condensation gutter; *D* zinc or copper sash bar; *G* metal cap bolted to sash bar; and *F* angle iron purlin, the metal sash bar resembling in section a piece of T iron gives the greatest possible strength for the weight of metal used, effectually provides for all possible contingencies in the way of leaks, or drip from condensation, and is a great advance on the slight and weak features of bars for the same purpose which have heretofore been used on other systems in vogue.

The Helliwell system of glazing is endorsed by such well known English engineers as Mr. W. Shelford, Sir Douglas Fox, Messrs. Hunt, Trubshaw, Johnson and many others, while among the noted buildings using it may be mentioned the Royal Agricultural Hall, at Kensington, London, having 180,000 square feet of zinc and glass; the roof being a single span 270 feet between supports and 400 feet long. In 1885, in England alone, 600,000 square feet of this system were used.

The glass in this system can be used up to 108 inches in length, thereby lessening the number of supports or purlins required and consequently reducing the weight of the roof.

Had the glass for the new Erie Depot, which we recently illustrated, been used in lengths of 72 inches instead of 36 inches it would have effected a saving of 3600 lineal feet of 3 by 4 inches medium angle bar, or about 50,000 pounds of iron at a cost put up of about $2500.

The sole agent for the Helliwell patent perfection system of glass roofing in the United States is Mr. Josephus Plenty, Horticultural Builder, at 144 Pearl St., New York City, who makes a specialty of glass roofs for any class of buildings.

CORRESPONDENCE.

Topography vs. Geology.

EDITOR OF ENGINEERING NEWS:—

In your editorial on "Topography versus Geology" in your issue of June 19th, you make statements and draw conclusions to which I cannot assent, and I beg to present some reasons for thinking differently. Your objections to having topography executed by the Geological Survey, I shall pass over with the remark that it does not necessarily follow that topographical work done by a Geological Survey is done by geologists, and secondly that examples of good topographical work, done under the direction of geologists can certainly be shown. That good topographical work has been done by the Coast and Geodetic Survey on limited areas none will attempt to deny, but you must at the same time admit, if you have read all the evidence submitted to the congressional committee referred to, that the officers of that survey are not so rash as to suppose that it will be possible to cover the whole interior of the country with work of like precision and expense.

But passing on to your remarks as to the cost of topographical survey, you say "We have been accustomed to consider that $15 or $20 per square mile would produce a topographic map of a fair degree of accuracy, and we know of no work done for a much less sum which would deserve to be called topography proper." This and your remarks following indicate that you hold the view which I myself once held, and which is held by many of our best engineers—that topography should be executed in the best manner, once for all, so that a resurvey shall perhaps never be required. But should not your professional experience teach you that the delight and satisfaction which any scientific man feels in doing his work in the best possible manner, would lead the director of the U. S. Geological Survey, or the director of any State or national survey to do only such work, were there not other considerations, vital to the success of his plans, which demand consideration? Can you doubt that, if he saw the means at hand, he would prefer executing a survey to cost $50 per square mile to one costing but $5?

Now that I may present the matter to you as it presents itself to the promoter of a State survey, let me suppose that an engineer is authorized to make a survey of the State of New York. He must first consider what amount he can ask for yearly with any hope of a favorable response. It may be $50,000. Now shall he make a survey like that approaching completion in New Jersey, which, by the evidence of engineers who have used it, is a valuable aid to them, and is amply sufficient for the use of all other classes, which will cost with triangulation just sufficient for the purpose, say $10 per square mile, and will therefore be available for use in ten years, or shall he proudly disdain to do any but the best work at a cost of $30 per square mile which will require thirty years to complete, supposing an impatient public and succession of remarkably appreciative legislatures allow it to proceed to completion at all. If he chooses the latter course, refusing to be taught by the experience of many auspiciously begun but disastrously concluded scientific enterprises, there are ten chances to one that he will suffer the mortification of failure and the State will invest a considerable sum in unavailable results. Will he who chooses the first, or he who chooses the latter course, prove himself the abler engineer?

Again; with the $30 per square mile which you suggest I believe that a survey can be produced which will require a publication scale of 3 inches to a mile to exhibit all its results, and render them available. Now this means that the map of New York will cover 4,000 square feet of paper, or about 600 sheets of a convenient size, allowance being made for margins, etc It will be much too unwieldly for general uses. The scale of 1 inch to a mile will occupy about 450 square feet of paper, or sixty-seven sheets, and is as large as can be used for a map for general purposes. An error of 60 feet in the final location of a point will not be perceptible on this scale, and $10 per square mile will produce a survey more than sufficient for the purpose. With the end of the greatest good to the greatest number in view, which survey will give the best returns for the money expended? Experience teaches still further that only by choosing the less expensive survey can we reach the more accurate and perfect survey. It is by having maps to use that the people learn to appreciate their value. They cannot be convinced, never having had reasonably accurate maps to instruct them, that an expense of $30 per square mile is justifiable. When, on a scale of expenditure of even $10 per square mile, could we reasonably expect to enjoy the use of a complete survey of the 3,000,000 square miles in the United States? With an army on the opposite bank suffering a lack of supplies would you condemn the engineer who crossed by a pontoon bridge instead of waiting to build a cantilever? Massachusetts and New Jersey, the States which have had the best maps in the past, are the foremost in the movement for something better. Will there be any waste? Will not the present surveys more than repay their cost, ere the more accurate survey shall be demanded by the people?

As an answer to the statement that you know of no work done for a much less sum than $15 or $20, which deserves to be called topography proper, I refer you to the published Atlas Sheets of the Geological Survey of New Jersey. Those who are acquainted with this work and have used it, regard it as a useful and valuable survey. As the territory covered is accessable to New York and the centers of population, the work has no doubt been already pretty thoroughly tested. In judging of its results it should be borne in mind that atlas sheets Nos. 6 and 7 which lie nearest the large cities, appear, as yet, only as preliminary editions, representing an expediture of but $3 50 per square mile, and are to be brought up to the standard of the other work which has cost $6.50 per square mile, as stated in the last report of the State Geologist, before the work is closed. It is believed, as previously stated, that a suitable triangulation could have been furnished had none existed for a total cost of $10 per square mile.

TOPOGRAPHER.

[We have the atlas of New Jersey maps, and have expressed an opinion as to its great merits. It is understood, moreover to be highly satisfactory in one important particular, namely, relative accuracy of location, and that this accuracy results from the fact that it is based upon the triangulation made by the U. S. Coast and Geodetic Survey. The cost of this geodetic triangulation is estimated by our correspondent at $3.50 per square mile, which may be a little low, although not much too low. The New Jersey topography, exclusive of triangulation, has cost $6.50 per square mile, which is 30 per cent. higher than Major Powell's highest figure for both triangulation and topography, or in other words our correspondent's estimate of the cost of the New Jersey maps is double that of Major Powell's estimate.—ED. ENGINEERING NEWS].

Fast Tunnel Driving in New York Aqueduct.

NEW YORK, July 21, 1886.

EDITOR ENGINEERING NEWS:

In your issue of the 17th, you print a statement regarding fast driving on the New Croton Aqueduct tunnel purporting to show that the best work to date was done at Shaft 23, south heading, using 3½-inch Eclipse drills. You also speak of the $300 *first prize* having been won by the boys working that heading.

But the facts have not all been told.

Copy of Notice Offering Prizes.

THE NEW CROTON AQUEDUCT,
O'BRIEN & CLARK, CONTRACTORS,
280 BROADWAY, NEW YORK, May 18, 1886.

To Shaft Superintendents, New Croton Aqueduct:

We will offer a prize of $500.00 to our employés on the New Croton Aqueduct to be awarded as follows:

Three hundred dollars to the gangs of men who shall, between the 25th of May and 25th of June, complete the greatest number of lineal feet of tunnel in the most satisfactory manner: and *two hundred dollars* to the next best. In computing the quantities, the Division Engineer's measurements will be taken; as regards the quality of work, our engineer, Mr. W. M. Hall, will be the sole arbiter. Allowances will be made by him for tunnel that requires to be timbered, and special attention will be paid as to whether excavation is kept within the required lines.

O'BRIEN & CLARK, Contractors.

Pretty nearly all the shafts under Messrs. O'Brien & Clark prepared themselves for the struggle of winning first prize.

That honor belongs to shaft 18½ south and it has been awarded $300 first prize. Your readers can see what amount of work has been done there in the month named.

Section 9, including shafts 19, 18, 18½, and 18B is under charge of Messrs. Paige, Carey & Co. The section of tunnel at 18½ is 20 feet 10 inches wide at bottom and 18 feet high; there are 14 cubic yards of rock to the running

foot as against only 6½ to ? at shaft 23. According to the contractors notice allowance was to be made for tunnel that required timbering; section 9 needs a great deal of timbering, and the distance driven through in the contest had to be timbered up, so that the engineers allowed 1 foot of tunnel at 18½ to be equal to 1½ at 23. Here are the figures; 18½ south. Distance driven in the month named: Heading 205 feet, bench 175 feet; section of tunnel 20 feet 10 inches × 18 feet. This is equivalent at shaft 23 to Heading 205 + 102.5 = 307.5 feet. Bench 175 + 87.5 = 262.5 feet; or in round numbers an amount of work equivalent to 290 feet of full tunnel at 23. Shaft 18½ then received $300, 1st prize. The timbering consisted of 5-piece sets placed 5 feet apart from center to center and lagged on the arch. 132,000 feet of lumber were used in timbering during the contest. This is not all; the tunnel was beautifully cleaned as they went along and ditched all the way through.

This remarkable piece of work at 18½ south, ranks as the foremost in the whole history of modern tunneling, where regard to cost is the essential condition. It has been accomplished under the immediate supervision of Mr. Leon F. McAleer, general superintendent for Messrs. Paige, Carey & Co. Well may he be proud of it and in heed of his whole work in Section 9. His able assistants in this stupendous piece of work were Mr. Frank Moran, walking boss, and Messrs. John Duffy and Edward Sheridan, heading bosses.

This unrivalled and remarkable piece of tunneling work was done with three No. 13 Slugger Rand drills, and two No. 3 Little Giant Rand drills.

At Shaft No. 13, under Messrs. Rodgers & Co., and immediate supervision of walking boss Patrick Kelly, the Rand drills drove 277 feet of heading alone; the number of feet of heading alone driven at 23 during the contest with Ingersoll drills was 266 feet.

Hoping, Mr. Editor, you will see that "honor is done to whom honor is due" Yours respectfully,

FAIR PLAY.

Contractors Intelligence,

Reported by T. H. Boorman.

Engineering and Building Materials.

WHOLESALE PRICES.

New York July 22, 1886.

IRON.

STRUCTURAL IRON.			
Angles		2.00c	@ 2.10c
" steel		2.35	@ 2.45
Tees		2.40	@ 2.45
Beams and channels, American		3.0	@
Tank plates		2.10	@ 2.20
Shell plates		2.4	@ 2.5
Steel plates, Tank		2.70	@ 2.75
WROUGHT-IRON PIPE. PITTSBURG.			
Butt welded, black	Discount		45
" " galvanized	"		35
Lap welded, black	"		60
" galvanized	"		42½
Boiler tubes	"		52½
RAILS.			
Steel (large lots at mill)		$34.00	@ $35.00
Old rails		18.50	@ 20.50
Old rails, steel		22.00	@ 23.00
R. R. spikes			2.40c
R. R. splice-plates		1.80	@ 2.00
R. R. track bolts, square nuts		3.00	
Barb-wire fencing, galvanized		4.38	
" painted			4.00
Corrugated iron			
Nails			
Iron, per keg		2.10	@ 2.20
Steel do.		2.55	@ 2.60

METALS.

COPPER.			
Lake Superior		9.75	@ 10.00
Other Brands		8.50	@ 9.50
LEAD.			
Com. Domestic		4.85	@ 4.90
Lead Pipe		.06¼c.	
Tin-Lined Lead Pipe		.15	
Sheet Lead		.07¼	
ZINC.			
Sheet		$5.70	@ 5.85

BRICK.

Cargoes (afloat)			
Choice Brands		7.50	
Haverstraw	per M.	6.50	@ 7.25
Fishkill		7.00	
Up-River		6.00	@ 6.50
Jerseys		5.50	@ 6.00
Long Island			
Pale		4.50	@ 4.75
FRONTS.			
Croton, red		11.00	@ 15.00
" dark		11.00	@ 15.00
" brown		10.00	@ 14.00
Philadelphia pressed		27.00	@ 28.00
Trenton "		25.00	@ 26.00
Baltimore "		37.00	@ 41.00
Buff "		33.00	@ 35.00
Enameled English		85.00	@ 130.00
" American		80.00	@ 120.00
Fire brick		25.00	@ 55.00
" American, No. 1		30.00	@ 35.00
" " No. 2		25.00	@ 30.00

ASPHALT.

ROCK.			
French		$20.00	@ 25.00
German		15.00	@ 20.00
According to quantity or brand, and whether taken from vessel or store.			
PAVEMENT.			
Barber's Asphalt		$2.50	@ $3.00

LIME.

Rocklock Cement Co.'s Ground		.80	
Rockland, common per bbl		1.00	
" finishing		1.20	
State, common		.85	
" finishing		1.10	
Kingston, ground		.90	
Add 25c. to above figures for yard rates.			

STONE.

Cargo rates at New York.

Amherst freestone, No. 1	per cub. ft.	0.95	@ 1.00
" " " No. 2	"	0.75	@ 0.85
" " " light drab	"	0.80	@ 0.95
Berlin " in rough	"	0.75	@ 1.00
Berea " "	"		
Brown stone, Portland, Ct.	"	1.00	@ 1.35
" Belleville, N. J.	"	0.75	@ 1.35
Granite, rough		0.45	@ 1.25
Common building stone per load		2.00	@ 3.00
Base stone, from 2½ to 6 ft. lengths, per lin. ft.		0.40	@ 3.00
Concrete and macadam stone, Tomkins Cove, per cub. yd			$1.65

SLATE.

Purple roofing	per square	6.00	@ 7.00
Green	"	6.00	@ 7.00
Red	"	15.00	
Black Penna. (at New York)	"	4.50	@ 5.00

LUMBER.

Prices for yard delivery in New York.

PINE, Common box	per M.	18.00	@ 20.00
" Choice	"	65.00	@ 70.00
Tally plank, 1¼ in. 10 in. dres'd, each.		.44	@ .50
Tally boards, dressed com.	"	.28	@ .30
SPRUCE, Boards dressed	"	.25	@ .28
Plank, 1¼ in	"	.28	@ .30
" 2 in.	"	.38	@ .40
" 2 in. dressed	"	.43	@ .45
Timber	per M.	13.00	@ 16.00
HEMLOCK, Boards	each.	.18	@ .20
Joist, 2½ × 4 to 4 × 6 in		.16	@ .44
OAK	per M.	55.00	@ 65.00
CYPRESS 1, 1¼, 2 and 2½ in	"	35.00	@ 40.00
YELLOW PINE, Girders	"	25.00	@ 30.00
Dressed flooring	"	28.00	@ 35.00
SHINGLES, Extra shaved pine, 16in.	"		
" sawed 18 in.	"	5.75	@ 6.00
LATH, Cargo rate	"	2.00	

PAINT.

Lead, white, American dry	per lb	.04¾	@ .06¾
" " " in oil pure	"	.07	@ .07½
" English, B. B. in oil	"	.08¼	@ .08¾
" Red, American	"		.06½
Litharge	"	05½	@ .06
Venetian red, American	"	.01	@ .01¾
Indian red	"	.08	@ .10
Vermillion, American lead	"	.10½	@ .11¾
Paris green	"	.15	@ .18
Umber, Amer. raw and powdered per lb.		.01¾	@ .01¾
Drop black, Amer.	"	.07	@ .12
" Eng.	"	.11	@ .13
Chrome green	"	.10	@ .25
Oxide zinc, American	"	.03½	@ .03½
" French	"	.05½	@ .07½

CEMENT.

The following price current is made up entirely from quotations furnished us directly by the firms dealing in each brand; the prices are understood to be wholesale in New York, subject to such special rates as large quantities may warrant:

CALVIN TOMKINS:		
"Old Newark Co's." Cement		$1.10
BAETJER & MEYERSTEIN:		
Hanover Portland	$2.60	@ $2.65
BELLONI & CO.:		
Hemmoor "Crown" brand		2.50
JAMES BRAND:		
Burham	2.25	@ 2.50
Fewen	2.25	@ 2.50
BROOKS, SHOOBRIDGE & CO.	2.45	@ 2.60
HOWARD FLEMING:		
Gibbs' English Portland, 400 lbs.	2.50	@ 2.75
K. B. & S. " "	2.25	@ 2.50
Stettiner, German	2.65	@ 2.85
Lagerdorfer, "	2.45	@ 2.75
Fieve, A 1, Belgian	2.35	@ 2.50
Roman	2.75	@ 3.00
Keene's Coarse	4.75	@ 5.50
" Fine	7.75	@ 8.50
" Superfine	8.50	@ 10.00
FISHER, ERSKINE W.:		
Stettin (German) Portland Cement	2.40	@ 2.75
GABRIEL & SCHALL:		
Vorwohler "Lion"	2.65	@ 3.10
HUDSON RIVER CEMENT CO. Rosendale		0
JOHNSON & WILSON:		
Saylor's American Portland	2.15	@ 2.45
LESLEY & TRINKLE, Philadelphia, Pa.:		
"Giant" Portland	2.20	@ 2.40
Improved "Union"	1.25	@ 1.50
Union	1.10	@ 1.20
MARCIAL & CO.:		
J. B. White & Bros. Coarse Keene's	4.25	@ 4.50
" Superfine	7.25	@ 7.50
" Portland	2.65	@ 3.00
NEW YORK CEMENT CO.:		
Rosendale		1.10
N. Y. & ROSENDALE CEMENT CO.:		
Rosendale, "Bridge" brand		1.10
SINCLAIR & BAUSON:		
Alsen's Portland Cement Works	2.35	@ 2.85
K. B. & S.	2.25	@ 2.50
STANDARD CEMENT CO		
E. THIELE:		
Dyckerhoff	2.90	@ 3.25
UNITED STATES CEMENT CO.:		
English Portland	2.25	@ 2.40
German "	2.00	@ 2.15
Standard	1.50	@ 1.65
Windsor and Improved Rosendale	1.00	@ 1.10
UNION AKRON CEMENT CO.:		
Akron "Star" brand.	1.00	@ 1.10

MARKET SUMMARY.

There have been no remarkable features in the material market this week. Brick has been in fair demand at prices quoted. Face brick is enquired for, the substitution in so many cases of brick for brownstone has kept the manufacturers actively engaged in supplying the demand and caused a rise in the price of Philadelphia and Trenton brick. Competition among the importers of English enamelled brick has made some break in prices for particular contracts but American has been firmly held at card prices. Cement has not been in active demand and it is reported that Rosendale has been sold at 95 cents per barrel, but the best known brands are firmly held at $1.10 per barrel in cargo lots; sales of 7,000 barrels of "Star" Portland to New York and Philadelphia parties are reported. Lath are of ready sale at $2 per M., a sale of 1,100,000 St. John was made this week at that price. Plaster keeps steady with good demand embracing other outputs than for building purposes alone, as formerly. Hair moves slowly and sales of cattle have been made at 20 cents per bushel, the price of goat has been maintained. The lumber and paint markets show little variation from last week and the price of nails is unchanged.

BUILDING ITEMS.

No work of importance has been placed on the market this week. It is anticipated that many buildings proposed to be erected early in the spring, and at that time abandoned on account of labor troubles will again be estimated on and lower bids will probably be obtained. The present price of building materials would seem to afford good opportunities for investors to improve property. The usual improvements on hotels, clubs, etc., made in the summer season are to be noticed. Among the later works projected, we notice a handsome residence to be built for Mr. Wm. Rockefeller on the northeast corner of Fifth avenue and Fifty-fourth street, to be fire-proof throughout and to cost about $500,000. Mr. E. L. Roberts, architect.

Small houses are considered now to be better investments than apartment houses; fourteen, to cost from $11,000 to $20,000, each are to be built on the east side of West End avenue near Ninetieth street from plans of Mr. J. F. Burrows. On 165th street east of Jerome avenue, eight two-story and attic frame dwellings 18 × 40 with extensions 18 × 16 are to be built at a cost of about $52,000 from designs of Mr. Chas. Baxter. Mr. Oscar Hammerstein will have six three-story and basement brick, stone and terra-cotta dwellings, 16.8 × 50, erected on the south side of 142nd street, 75 feet west of Seventh avenue from designs of Mr. Andrew Spence, to cost about $72,000. Mr. Wm. H. Stafford has had plans prepared for four four-story and basement stone front houses to be erected on the north side of eighty-second street, 500 feet east of Tenth avenue, to cost $12,000 each. Messrs. D. & J. Jardine, architects. Several new school houses are to be built, contract for Grammar School No. 2, on Henry street has been awarded to F. D. Gibb and for the King street Grammar School to Thos. Cockerill & Son. For the Presbyterian Hospital a building 111 × 55 is to be erected on 70th street and Madison avenue from designs of Messrs. J. C. Cady & Co. Estimates are being received by Mr. L. J. O'Connor for the Home for the Aged to be built by the Little Sisters of the Poor, on East 70th street near Third avenue. St. Luke's Hospital is to receive an addition, being a four-story brick house for the Superintendent, to cost $50,000; Mr. G. E. Harney being the architect and J. J. Tucker the builder. Mr. Wilbur S. Knowles successor to the late Fred. B. White has completed plans for residences for Orrin Parry at Indianapolis to cost $7,000; for a similar cost one for Nelson B. Mead at Greenwich, Conn., and four for J. H. Gourlie, Jr., at Yonkers, N. Y., to cost $24,000. Mr. August Belmont will build a Memorial Chapel in the Island cemetery, Newport, R. I., it is to be of red Carlisle stone with tower and elaborate carvings and will contain memorial windows.

The Park Commissioners have called for new estimates for the enlargement of the Metropolitan Museum of Art in Central Park: mason, carpenter, iron and plumbing work to be separate contracts and bids to be in by the 4th day of August. The Board of Armory Commissioners have called on architects for plans and specifications for armories for the Eighth and Twenty-second regiments to be submitted before August 12th.